A REPORT

ON THE

SANATORY CONDITION

OF THE

BOROUGH OF SHEFFIELD.

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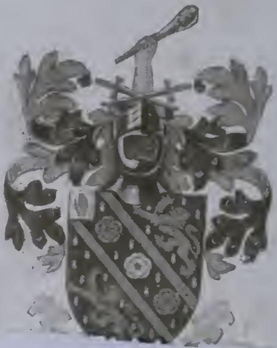

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Robert Roper
Surgeon

A REPORT

ON THE

SANATORY CONDITION

OF THE

BOROUGH OF SHEFFIELD.

BY

JAMES HAYWOOD, PROFESSIONAL CHEMIST,

AND

WILLIAM LEE, C. E.

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TO THE HEALTH COMMITTEE
OF THE
TOWN COUNCIL
OF THE
BOROUGH OF SHEFFIELD.

GENTLEMEN,—Having, agreeably to your request, undertaken certain investigations and inspections to enable us to report on the sanatory condition of the Borough of Sheffield, and having now, after considerable difficulty, brought our laborious task to a close, we beg respectfully to present you with a report in the following form.

1st. A report on our mutual inspection of the town, with remarks on all local nuisances, such as stagnant pools and filthy drainage—open privies—soils saturated with bad drainage—slaughter houses—and other matters affecting public health; with remedial measures and calculations respecting the value of town's refuse—its preparation and application to agricultural purposes; chemical quality of the water supplied by the present Water Company, as well as of that capable of being supplied at any future time; the present state of the ventilation of houses, workshops, and public buildings, with suggestions for improvement; the evils arising from the non-consumption of smoke, and other matters of CHEMICAL INQUIRY, written by Mr. Haywood.

2nd. A report, by Mr Lee, on the physical geography and geology of the district, and on all matters of engineering and construction, as connected with the water supply—drainage—state of the pavements of streets, courts, &c.—cleansing of the town—application of the town refuse to agricultural purposes—obstructions of the rivers by goits, weirs, &c., and on nuisances producing similar effects — new thoroughfares and width of streets–structure, arrangement, and ventilation of houses—the structure, arrangement, and ventilation of workshops — sanatory condition of the Sheffield Union Workhouse, and on town interments—on the legislative powers necessary for sanatory purposes—and in whom such powers ought to be vested, and on the best mode of repayment for permanent sanatory improvement, &c.

REPORT

ON

OUR MUTUAL INSPECTION OF THE TOWN.

BY JAMES HAYWOOD.

Position and general features of the town.

THE town of Sheffield is situated on the banks of the two rivers, Sheaf and Don, both of which rise in the high moorlands on the west, and flow through fertile valleys which meet near its eastern boundary. The surface on which it is built is exceedingly irregular: the streets rising abruptly and extending towards every point of the compass, but more generally towards the west, it may consequently be said to present an eastern and north eastern aspect, and to be fully exposed to these winds; though from the irregularity of the surface, and from the hills on the west and north, many parts are considerably protected. There are three localities in the town in which the ground is flat, viz., Shales-moor, on the north west; the Wicker, towards the north east; and Sheffield-moor, on the south. The period is not distant when these parts of the town were the seats of bogs and morasses, &c., now rendered dry by efficient draining; from Sheffield-moor in a westerly direction crossing the Porter rivulet, the ground rises by a gentle inclination towards Broomhall and the Glossop-road, a part of which may justly be termed the West End, and it is probably the most healthy district in Sheffield. Proceeding in a north westerly direction we find the surface exceedingly irregular and steeply inclined, presenting every conceivable aspect, till we reach the valley of the river Don; here are situated, on its western slope, the Barracks, the Infirmary, and St. Philip's Church. Crossing the river and turning towards the eastern side of the valley the ground rises irregularly towards Bridgehouses and Pitsmoor, both of which occupy the abrupt termination of a range of hills extending along the eastern bank of the Don, and thickly wooded to within a distance of three-quarters of a mile of the town. Pursuing the course of the river to its confluence with the Sheaf, we pass through a district thickly occupied by manufactories, and densely populated by artizans who are employed therein. Crossing the valley of the united streams, which now extend in an easterly direction towards Rotherham, we encounter the elevated ground, formerly the park of the Earls of Shrewsbury, but now occupied by a population of not less than 10,000 souls, mostly of the humbler classes. On turning still more southerly, we again arrive at the point from which we started, the flat district of Sheffield-moor. Having traversed the whole town towards the west, the north and east, and back again to the south, the whole surface included within the above circle is exceedingly irregular, but not so densely populated as the same area in most other large towns. The greater proportion of the dwellings of the poorer classes are two stories high, frequently built back to back, and furnished with cellars, but often without that useful appendage; a considerable proportion of the inhabitants in the lower parts of the town are Irish. Geologically, the town may be said to stand at the junction of the mill-stone grit with the coal series;—the fine grained beds of sandstone which come to the surface on the west, and which dip under the town at a considerable angle were formerly those from which very good well water could be obtained by boring through the clay bed above, but which now are the means of carrying downwards the stagnant drainage from cess-pools, church yards, &c., rendering such water impure and unwholesome. The clay bed above named occupies by far the greatest extent of surface under the town of Sheffield: it is of a blue colour and exceedingly tenacious, and frequently used for making bricks. In the more modern parts of the town, the pits from which the clay has been obtained for brickmaking, have become full of stagnant drainage, and exceedingly offensive, while in the older part they have been filled up with absorbent materials and the whole saturated with the same kind of liquid filth. A very considerable portion of the ground surface thus acquires the condition of a putrid bog or morass, and is undoubtedly one of the principal causes operating to increase the scale of mortality in the town; in addition to this unhealthy condition of the surface, we have also stagnant pools formed by diverting the natural streams and damming up the water courses for supplying the various manufactories on their banks; these, as will be seen hereafter, are often sources of Malaria of a most formidable kind, so that notwithstanding the position in which the town is placed,—the absence of all flat swampy land, and the best possible inclination for drainage, the town does not present those sanatory features we should at first sight be led to expect.

SPECIAL NUISANCES, AND THEIR EFFECT UPON HEALTH AND MORALS.

Bridgehouses. Special nuisances.

Yard belonging to Railway Company, New-field.

Mrs. Somerville's property, Mr. Hawksley, agent, cannot afford to alter it.

Mr Beet's property, pawnbroker.

In many parts of the town where the inclination of the surface is considerable, and where drainage from courts and yards might have been effected with the greatest ease, we find stagnant water and drainage from the privies of the most filthy description. In several courts in Bridgehouses these privies are public ones, accommodating from seven to fifteen families each. They are occasionally placed in the centre of a large square yard, without any division from the houses opposite to them, except a rude door which in some instances could not be closed for filth. This must have a strong tendency to lower the scale of morality in such places, and to induce habits of the most vulgar description in the younger branches particularly. More frequently these privies are placed in one corner of the yard, often terminating a row of buildings, and consequently are more protected from inspection than the former. Although this in some measure does away with the objection above named, we find another, and probably a greater evil from this position. From the rapid accumulation of night soil and other filth from fifteen or twenty houses these receptacles are soon filled, and from the inclination of the surface, and porous nature of the soil, the liquid portion is soaked up and converts the whole neighbourhood into putrid magma of the worst description. In one yard this liquid drainage appears to have been obstructed, and finds its way to the surface in the form of a putrid spring; in many others it oozes through the side of the cess pool and flows down the yards and courts within a very short distance of the doors of the inhabitants. This is particularly the case in one of the courts in Pye-bank, where a privy used by eight families is situated at the top of a small yard not more than three feet broad considerably above the level of four houses the doors of which are close to the surface drain: the stench even at this season is abominable, and two families have been obliged to leave in consequence. Two courts leading out of Bridgehouses are in a similar condition: in one of these there are three doors within five yards of the privy itself, the inhabitants complain very much of the bad effects produced on them by the offensive smell. Probably the worst of these effects arises from the putrid drainage when it accumulates in the cellars, and soaks through the walls of such rooms as are constantly occupied by a family. This is too frequently the case in the hilly district of Bridgehouses, Pye-bank, and the lower part of Chapel-street and New-fields. In one court in the latter district we found the cess-pool heaped up three or four yards above the level of the ground floors of the adjacent houses, into which it drains, constantly rendering the walls damp and offensive. Fever has been bad here, and several deaths have occurred. The wife of a person occupying the house nearest to this nuisance has never been well since she came, and will be obliged to leave in consequence. Another yard in this district has a privy accommodating eight or ten families, the cess pool of which is placed close to the walls of a house situated on a lower level; the drainage through the walls and into the cellar is most offensive; the occupant of this house has recently lost her husband from consumption, and *three children from fever*, she has two young children still living, but in a very unhealthy state. In consequence of having them and herself to provide for, she dare not leave the neighbourhood, where she is known, although she is well aware that her life and that of her children must be shortened by remaining. We may here remark that this person appeared very respectable and cleanly in her habits, so that disease could not possibly be attributed to any neglect in this respect. There were also several houses situated in a court in Chapel-street which receive the drainage from the cess pools above; here there have been several cases of fever, some of them fatal. There are still three or four persons exceedingly ill, and not likely to recover. With these facts before us there can be little doubt that the unhealthy state of Bridgehouses, and the adjacent neighbourhood, is mainly owing to the thoughtless manner in which the privies and cess-pools have been placed, draining, as they do, not only into the ground, but into the adjacent houses, poisoning their inhabitants. The disgusting nature of such a state of things is beyond description, while the evil consequences produced, call loudly for some sanatory measures to protect the health and lives of the people.

David Stones' tenant.

Elizabeth Newson tenant, Mr. Smith, shoemaker, owner.

Owner unknown.

The streets in this district are unpaved, and the surface and under drains are clean and effective; the courts are generally unpaved, and the porous soil absorbs the principal part of the drainage as described above. Here in many places the water stagnates and form filthy pools, which are frequented by children who besmear their clothes and persons with their contents, and consequently convey the nastiness into their habitations; a practice occasioning dirty dwellings, which are allowed to remain dirty by reason of its constant repetition; hence filthy habits may soon be acquired by residence in filthy places. This is remarkably the case in Beaver's yard, Bridgehouses, where the surface at the time of our inspection was a complete puddle. The houses are here in a most filthy and dilapidated condition, while the inmates are in perfect accordance with their habitations: this forms a striking contrast to some of the nicely paved yards in other parts of the town, in the whole of which the greatest cleanliness appears to be observed both in the houses and inhabitants. If the owners of property would take the trouble to look for themselves, and see the difference produced in the character of their tenants and property by the small expenditure consequent on paving, &c., they would not hesitate one moment to incur it. In fact, paving may be considered a most necessary appendage to all new buildings, and one of the most important improvements to old. Taking the houses of this district generally, both in paved and unpaved courts, we find the rooms, with few exceptions, well lighted and ventilated by windows and fires. The houses, many of which are three stories high, and placed in rows back to back, are occupied by one family, the members of which are generally employed in the Sheffield trade; the rent paid for such houses varies from 1s. to 1s. 9d. per week according to situation; at least as much attention is paid to personal and domestic cleanliness in such houses as is the case in other large towns; and, on the whole, this district may be considered as having a character rather above the average as to its manufacturing population.

See Mr. Hawke's yard, Sheldon-row, in the worst part of the town.

Taking the districts included within the semi-circular sweep of the river from the Iron Bridge to the top of Saville-street, the surface is nearly level, but still has sufficient fall to insure perfect drainage. The whole of this district has surface and underground drains carrying off the house refuse, which, however, has to traverse a considerable distance before it can escape into the main sewer. The streets here are unpaved, but, with the exception of Johnson-lane, which is full of ashes and filth, and the Wicker, of which constant complaints are made on account of its filthy character and bad repairs, are generally clean. The courts and yards out of Johnson-street, Stanley-street, Wicker-lane, and Nursery-street are open, well ventilated, and clean; but in some cases too large an accumulation of night soil in the cess-pools has been permitted, which thereby become very nauseous and offensive. One we must name in particular, in consequence of its having existed in the same state for a considerable period: that in Mr. Hutchinson's yard, Andrew-street, which should be immediately removed. It is, moreover, certainly

Wicker neighbourhood.

objectionable that manure heaps should be permitted to remain exposed in confined situations. With the exception of those in Nursery-lane, the privies are clean. There is an accumulation of many hundred tons of street refuse at the Police depôt, in Wicker-lane, which contains from 15 to 20 per cent. of vegetable matter, and which, in the process of putrefaction and decay, gives off noxious gases, attended in warm weather with disagreeable odours, not only offensive, but highly injurious to the health of the neighbourhood. Such depôts should certainly not be allowed in a populous district like Wicker-lane, but ought to be removed quite out of the town.

Mr. Brigg's yard.

The yards on the north side of the Wicker are generally close and badly ventilated; there are two which present the very objectionable arrangement of dwelling-houses over privies, one of which is frequented by 19 families, and by the children of a school, which is over it. This privy, as might be expected, is exceedingly filthy, and drains into the adjoining houses, which the tenants are constantly leaving from the abominable stench thus produced.

Dodson's yard.

Templeman's yard.

The courts on the south side of the Wicker, adjoining the goit, are generally close, badly ventilated, and in a dirty state, but in consequence of the privies, which are in a most filthy condition, being placed immediately over the goit, none of the houses suffer from their drainage.

The rooms of the houses here are low, and the admission of light and air very imperfect, a fact plainly indicated by the pallid faces and feeble half deformed limbs of a number of unhappy children inhabiting this locality.

This consideration should induce owners of property of this description in any district, to ameliorate the condition of their tenants, by making such alterations and improvements as will, at least, secure to them a sufficient light, and a free circulation of air. The yards on the other side of the goit are generally more open, and consequently receive a more liberal amount of light and air. There is, however, a very confined yard in Sheldon-row, the drainage from which finds its way into the cellars of the neighbouring houses, and it is injurious and offensive to the inhabitants; but the privies are generally so situated as not to be injurious in this respect, but only objectionable from their filthy state, and the number of families they are intended to accommodate.

Mr. Merril, Bailey-field, owner.

Sargent's-square.

Park district.

The Park district, including all that portion of the town on the west of the river Sheaf, extending from the New Gas Works to the Cholera Ground, is situated on a declivity with an eastern and north eastern aspect. The streets, many of which are paved, or well macadamized, are kept clean of any surface water or filth which may be thrown into them by the rain, in consequence of their great inclination, although the district is only partly drained: the houses in many places are very low, consisting of one or two stories, and are crowded together in the most irregular manner, forming angular yards of the most inconvenient description; the rooms, which, in many places, are not more than six or seven feet high, are badly lightly and ventilated, although situated in an airy district. The drainage from such houses generally passes over the surface, which is rendered filthy in consequence. In some cases no care whatever has been taken to place the privies in such a situation as to admit of their being easily emptied, or to prevent their draining under the foundations, or into the houses and cellars of the inhabitants.

Mr. Littlewood's property.

There is a yard in Snow-hill-lane, where filth of this kind has been accumulating for years, and is now heaped up to a considerable height above the level of the houses adjoining: this is not emptied in consequence of the narrowness of the passage not allowing a barrow to enter. The adjoining yard is in a simalar state, or even worse, as the refuse is actually *heaped upon the roof* of one of these miserable dwellings; the putrid drainage from this refuse is abominable, and although three loads have been removed from one of these heaps, the inmates of these wretched places state it appears no less. There are also similar accumulations in a yard in Broad-street-lane, and in Sussex-street, which ought to be removed.

Property adjoining.

Mr. Walton's yard; drains from Hardwick's property.

Probably the most palpable instances of the injurious properties of this privy drainage, on the health of the public, is found in a small square yard in South-street, where the occupants of four clean cottages have never been free from low fevers or other epidemic diseases for 18 months past. We found that the cellars of two of these houses were occasionally two feet deep in a dark coloured liquid, which is even at this time (April) in a constant state of putrefactive decomposition, giving off noxious gases of the worst possible description. A portion of this liquid has been submitted to analysis, so as to leave no doubt of its baleful character. The putrefaction of these organic matters gives rise to carbonic oxide, carburetted hydrogen, sulphuretted hydrogen, and other gases, which dissolve and carry away in a gaseous state, small portions of the putrid fluid itself, which, when taken into the lungs, produce the most disastrous consequences. There are several other instances of a similar character in various parts of this district. A yard in Duke-street con-

Webster's yard.

tains a privy in a most filthy state, perfectly full of ashes, night-soil, and vegetable matter, in a state of decay and putrefaction; the drainage from this soaks through a wall into the adjoining house, where the tenant has lately had an attack of fever, and has not yet recovered. Previously to this attack, the woman had been very strong, and had never suffered a day's illness.

Another filthy place in Duke-street-lane drains through the walls of two houses, and has done considerable injury to the health of the inmates. One of these houses was occupied by a family for two years, who suffered from ill-health during the whole time, and were ultimately obliged to leave in consequence: on removing to another place, their health was perfectly restored. The tenant of the adjoining house has suffered from low fever during the last six months, and has now all the symptoms likely to be produced from breathing a polluted atmosphere.

Privy in Mr Sellers' property, houses in Schofield's yard. John Horsefield's family.

There are also privies in East-street perfectly full, and giving off liquid drainage of the most offensive kind; this soaks through the walls of an adjoining house, one of the inmates of which has had an attack of fever, and has had general ill health ever since her residence there. Though it may appear unnecessary to introduce further evidence to prove the injurious properties of these accumulations of filth, we shall proceed to point out three localities where the least attention appears to have been paid to the construction, locality, or cleanliness of these receptacles. There are several yards in New-street where the accumulation of night soil, &c., is exceedingly great, and where pestiferous drainage completely saturates the whole district. In many instances the ashes, &c., have been thrown into the yard itself, together with the excrements of children to form materials for road surface, in consequence of the tenants not being able to get any person to empty the cess-pool: this, in one instance has been the case for more than twelve months. In summer the odour produced from this putrid mass is most offensive, and no doubt the effects are injurious. This is also the case, though in a less degree, in three other yards in this street, where the surface is completely saturated as before described, and the refuse considerable.

Mr Staniforth's property. Mrs Ogleby tenant.

Mr Nicholson's property. J. Ward's evidence.

Mr Brown's property. Mr Jeffcock's property.

On inquiry we have generally found that cases of fever have been frequent in localities of this kind, though not so obviously referable to predisposing causes as is the case where cess-pools drain through the walls of houses and fill their cellars. In High-street-lane and Matthews's-lane, there are several privies of a most revolting nature, being quite full

Leman's property.

and having ashes scattered around. From such places cottages are often distant only a few feet, of which the doors open full on the discreditable sight, the inhabitants being poisoned with the pestiferous stench—disgusted by the putrid matters brought in by their feet, and half-stifled with the dust resulting from the sifting of ashes. One family had three children ill of fever from such causes, and we also found two other people suffering from putrid drainage in Shales-square.

Mr Timperley's property.

There are several filthy yards from privies and pig-styes in Bernard-street, which must be exceedingly injurious to the public health. There is one in which the whole surface is covered with the excretions from pigs, and the ground saturated with their urine, and this close to the doors of 5 cottages, which is a great nuisance to the inmates as being a constant source of filth. The cess-pools in most of the courts out of Duke-street are full; the ash pits situated behind them are generally open, so that in a high wind the ashes are scattered in all directions: in both cases these are obvious nuisances.

Woolhouse-square.

Ropery-row

Mark Thompson's property.

Collier's-row.

The privies in the Park district are generally of the most filthy description, particularly those in Snow-lane. In some instances one privy has been built for the accommodation of from 10 to 15, or even as many as 24 families; so that the rapid accumulation of refuse and the total want of cleanliness is easily accounted for. The disgusting character of these receptacles is among the most fertile sources of filthy habits in those persons who frequent them: we would consequently impress upon the owners of property where such places exist, the strong necessity of appointing some person to see that they are regularly cleansed; for unless this be done, all the attendant evils of filthy habits and filthy houses must necessarily follow. There is one more subject to which we would call the attention of your committee, as being of importance to public health; it is the practice which prevails in this and many other districts of the borough, of building dormitories over privies. There is a family in Woolhouse-square who occupy a room of this description, over a privy intended to accomodate 24 families, the gaseous emanations from which have been so disastrous as to destroy the husband and one child within a very short space of time. We are very glad to find that this practice is now becoming less general than formerly, and that several places of this character have been removed.

In consequence of there being no sewers in a great part of this district, the house drains run down the side of the streets, and in level parts become stagnant and offensive;

this, however, is only the case in some few instances. In New-street-lane, School-lane, High-street-lane, and St. Mathew's-lane we find this drainage saturating the soil, and forming very bad road surface.

Accumulations of ashes are also left in these lanes and are the nuclei for the depositions of all kinds of filth: these ashes are the grosser parts left by the scavengers in empty ash-pits and cess-pools.

If these ash-pits had been constructed with a grate, in such a manner that all must have been sifted before getting into them, those rough ashes would have been burnt, and this evil prevented. We would strongly recommend that all ash-bins should be provided with a fine grate of this description, and so constructed as to exclude the rain; their contents would then be valuable tillage for land, and as such would be readily disposed of for that purpose. A great part of this district is inhabited by colliers, whose employments are not very conducive to personal or domestic cleanliness, and we should consider the general moral aspect of this district to be beneath the average of the town.

Pond district, between rivers Sheat & Porter.

Taking the district included between the two rivers Sheaf and Porter, commencing at Pond-mill and Shoreham-street, and including Suffolk-road, Fornham-street, Pond-street, Shemeld-croft, and the adjoining populous districts to the Gas House, we pass through the oldest and worst constructed part of the town; the courts on each side of Pond-street, contain poor miserable dwellings, with low rooms imperfectly lighted and ventilated, and subject to all the nuisances arising from filthy surface drainage and exhalations from the various stagnant ponds. The amount of filth derived from the main sewers and manufactories, and deposited in these places is inconceivable, and the stench given off in summer, when the river is low, is most offensive. The lower end of the goit running parallel with Pond-street was formerly a complete cess-pool, containing nothing but putrefying animal and vegetable matters to the depth of two or three feet: this, however, has been removed and a little alteration made, in order to turn a stream of water through it, but this has proved so ineffective, that putrid accumulations are again taking place, spreading disease and death in their course, in the most appalling manner.

There are few families in the immediate neighbourhood of this pestiferous place who have not suffered more or less from its influence. In Court No. 7, the whole inhabitants have been affected with low fever, and tenants are constantly

(left) James Beever, wife and three children, low fever
John Aslam and wife, low fever.

(left) George Hawksworth, self and child, fever.
(left) John Fox, self and wife, fever.

leaving from the known unhealthy state of the yard. In many places the poor inhabitants are compelled to remain in their dwellings in cousequence of their straitened circumstances, whither they were induced to come by the lowness of the rents. But in every case, on inquiry, we found the people resolved to remove as soon as they were able: too often, however this time never arrives, for from constant ill health and loss of labour, their circumstances are seldom improved but rendered worse and worse, and if death should take off the main branch of the family, nothing is left for the survivors but the Union. We consider that a very high responsibility rests upon the owners of this property, and of the goit in particular on account of their prejudice to the public health, and to life itself; and if people are allowed to divert a public water-course, and to form catch pits for the accumulation of the filth of the town, whereby poisonous miasmas are diffused; it should not be done in a populous district, where thousands may become sufferers for the benefit of the few; these things, however, are now and have been in existence so long, and the increase of filth from the extension of the town, from its drainage, and manufactures, has been so gradual, that it is difficult for one who has been constantly on the place to understand that such a change can have really occurred. But any stranger competent to judge, would, on inspection, advise that all such nuisances should be immediately removed. There are several processes carried on in the course of the stream, such as boiling bones, &c., whereby the stream becomes polluted with large quantities of putrid animal matter, rendering it probably more noxious than even the town drainage itself. These processes, although not generally considered injurious in themselves, become highly so when their products are suffered to run through and stagnate in a populous district, and moreover they are highly offensive, and should be removed to the outskirts of the town, where their drainage may flow readily away. In consequence of a large amount of sewerage-water being poured into the Porter brook about Sylvester-gardens, a much larger amount of putrid vegetable and animal matter is collected in the various mill-ponds, whereby they are rendered much more offensive and injurious than they formerly were. If such ponds are allowed to exist in the centre of a populous district, care should be taken by the authorities to protect their waters from such contaminations by carrying the town sewerage below them, as, if these accumulations be suffered to increase, they will soon assume the deadly character of the goit above described, and upon a more extensive scale. There is one of these catch-pits which on account of its receiving little more than the sewerage water, and that which has been used for boiling bones, requires special notice and immediate attention. It is a tank attached to Mr. Smith's saw-mill, about 50 feet by 20 in dimensions, partly covered over by loose timber, and partly exposed to the air. The black semi-fluid contents of this place appear to be in a constant state of fermentation from the escape of noxious gases, and putrid vapours. It also contains a number of dead animals which contribute very much to its offensive odours. Fortunately, their are no houses in the immediate vicinity of this abominable cess-pool, or its effects on the inhabitants, together with those resulting from the stream itself, would be most malignant. It is clear, however, that miasmas resulting from such sources, exert their influence at very considerable distances. The fact that low fever prevails in this neighbourhood, and which has compelled several families to leave, seems to prove that such is the case. The same remarks also apply to the larger ponds in this district, from whence noxious gases are constantly escaping. It may here be remarked that the above cess-pool was constructed for the purpose of collecting water to supply the boiler of a steam-engine, and it is so used at the present time.

Cess-pool belonging to Smith's wheel.

Mr Smith himself.

The situations of the privies in the Pond district are in many cases bad; in several yards in the lower part of Pond-street they drain into the houses, saturate the soil, and produce the usual spmptoms in the inhabitants.

In Wastnidge's yard this is particularly the case, as two families are constantly suffering from noxious exhalations arising from this cause. One child died a short time ago of fever, and many others suffered from the same disease. There are also several privies situated under dwellings, and generally made so close that the gaseous exhalations from them must pass through the floors into the sleeping-rooms of the inhabitants. One situated in Boden's yard is so offensive and injurious to the tenant who occupies the house, that his family has had constant ill health ever since they resided there. One of his children has died from its effects. Another in Miss Shirley's yard has produced similar results on one of her tenants from a like cause. We observed, in most of these cases, that the roof of the privy and cess-pool has been carefully underdrawn with lath and plaster, with a view, no doubt, to prevent the ingress of any noxious exhalations into the room above. We take this opportunity of stating, however, that such

James Moule's family: Mrs. Gilbert's.

Privies under dwellings.

Thos. Furniss.

means are perfectly ineffectual; for, independently of the cracks in the plaster, and the evolved ammonia, converting it rapidly into nitrate of lime, gases can readily pass through porous substances like plaster, by *diffusion*. When fires are present in the rooms above, there would be a constant current through the floor, and hence the injurious effects observable.

Passage of gas through plaster.

There are many other cases in this district where the houses although not absolutely over the privy, are situated so near to it, or its cess-pool, that they are constantly exposed to foul air.

Wm. Gould

In Well's yard, No. 6, Pond-street, one family is constantly suffering in this manner. In Wilson's yard below, a privy is situated close to a house—drains through the wall, and the tenant's wife is suffering from low fever at the present time.

J. Waterhouse

In the neighbourhood of River-street, River-row, Forge-lane, and Shemeld-croft, where the houses are of the worst possible description, we observed as great a want of decency in these places as we have observed in the Park district.

In some cases, one dirty privy is intended to accommodate from eight to twelve families, the rapid accumulation in which, and the difficulty in getting them emptied, render them entirely useless, or in the highest degree offensive and injurious to the inhabitants.

In Shemeld-croft, there are actually eight or nine houses without accommodation of any kind; the surface drainage, as might be expected, is exceedingly offensive in this place, and is often allowed to remain in heaps close to the doors of the inhabitants for some time. Such a state of things requires the interference of the authorities, and really some steps should be taken to insure a greater degree of cleanliness, and better accommodation for the inhabitants.

The moral and physical character of the people in this district appears to correspond exactly with its dirty and deplorable appearance.

From the top of Little Sheffield, along South-street, Norfolk-street Baker's-hill, and the Haymarket, to the Lady's-bridge, including the property on the South not before mentioned.

The district commencing at the top of Little Sheffield, and extending along South-street, Norfolk-street, Baker's-hill, and the Haymarket, down to Lady's-bridge, including all the property on the south not hitherto named, has a gentle inclination towards the rivers Porter and Sheaf, affording every facility for natural and artificial drainage.

The streets in the greater part of this district are laid out with some degree of regularity; having, in many instances, back lanes into which all drainage from dwellings, &c., is allowed to pass. The cess-pools also have doors opening into the lanes for the convenience of emptying, affording such facilities, that occupiers of this kind of property find little difficulty in getting them emptied and their contents conveyed away. Of these lanes, generally private property, few are paved, drained, or provided with proper sewerage, the slops from houses, the drainage from privies, and other surface-water, finding its way down as best it can, being frequently obstructed in its course, until it gets into the main sewer in the public street. These lanes are also taken advantage of for the deposition of rubbish of different kinds, which soon becomes saturated with the above drainage, and very offensive. The coarser contents of the cess-pools are left in them to be gradually washed away or converted into road surface. The whole, in fact, ultimately becomes a manure heap of a most formidable kind. This is particularly the case in Charles-lane, Howard-lane, Froggatt-lane, Surrey-lane, Hermitage-lane, Royal Hotel-lane, (Earl-street) and a lane at the back of Mr. Sampson Mason's property, in Porter-street. All, or most of these, are closely connected with streets in which there are good main sewers, and into which all this liquid filth should be carried by underground drainage; they should also be paved, as the most effectual means of preventing the accumulation of filth, and would then become most useful and sanatory appendages to the adjoining property, instead of being a nuisance and a source of disease, as they really are.

Filth and bad drainage in lanes.

The principal streets in this district are generally well paved and drained, and consequently cleanly. The lower part of Jessop-street, however, has no main sewer, and contains stagnant drainage, and a saturated surface to a considerable extent. Bramhall-lane, too, has an exceedingly bad road surface, no drainage, and is generally a complete puddle of black mud and stagnant water. No attention whatever appears to have been paid to this road, although one side is densely populated, and the inhabitants complain very much of its disgraceful state. There is also a great deal of stagnant drainage and bad road surface in Sheldon-street, which certainly ought to be removed. Perhaps the worst instance of this nature occurs in Sylvester-lane and Sylvester-gardens. There is scarcely a yard of ground in this level district which is not covered with filthy water from houses or privies. The very foundations of the houses are saturated with it. If there is any locality in the borough where a main sewer is absolutely required, it is here; for the utter absence of drainage, and neglect of the commonest sanatory

Sylvester-lane and gardens.

measures, appear to have led to more epidemic disease than we have met with elsewhere. There is fever at the present time, and the inhabitants state they are never free from it. The first case of Asiatic cholera occurred here, and there is every reason to believe it to be the most unhealthy locality in the town.

Yards and privies.

The yards and privies in this district present similar characteristics with those already mentioned, the latter being of a most filthy description. Those in Sylvester-gardens are placed in such situations, that their contents drain into houses, or down the unpaved yards, producing the usual symptoms of low fever in all who come under their influence. In Sylvester-yard, which is very close, the privy drains into a house, where the tenant's wife is constantly ill from its effects. There is now, and always has been, since the above tenant resided in this house, a great deal of sickness in the yard, undoubtedly arising from this filthy drainage, and the vapours exhaling therefrom. The yard opposite to this contains a dwelling over a privy, the occupant of which has never been well since she came. There is fever in the house adjoining the privy, and a great deal of illness constantly here. Another yard at the top of Sylvester gardens is in a most filthy state; houses dilapidated and scarcely habitable, yet still occupied by a few poor tenants, who are unable to pay higher rents. There are several houses in Newton-square exceedingly unhealthy from receiving privy drainage, or being situated so near thereto that the tenants are constantly breathing a polluted atmosphere. One house is so much exposed to its influence that no person can long reside in it, and the tenant of another is constantly suffering from similar effects. One whole family (mother and three children) has been for some time laid up with low fever, in a house adjoining a privy in this locality, the smell from which is at all times very offensive.

Geo. Darley's house.
Hobson's wife.
Walker's-yard.
Mrs Haughton
Hy. Barlow.
Newton-square.
Mrs Mills.
Holland's wife.

Earl-street. Privies under workshops.

In Earl-street the privies are generally situated under workshops, a plan which is most objectionable, as it exposes the main supporters of families to all those evils which we find attending the constant occupants of houses having a similar arrangement. It is true we have found few cases where serious effects have been produced from this cause, which may be accounted for by the fact that only a small portion of their time is spent under its influence; yet, undoubtedly, some injury must be produced, as is manifest by a sense of languor of which these men constantly complain. We strongly recommend that such a plan should be in future discontinued, and that these places, as long as they are built at all in preference to water-closets, should be removed to the greatest possible distance from both dwellings and workshops.

In Cadman's property, in Earl-street, there is a family residing, the mother of which is constantly ill from the presence of privy drainage in her house ; and several others in Sydney-street and Furnival-street are suffering from a similar cause. There are also two families residing in a very close court in Union-lane, in a like condition. In this case, there are 16 houses to two bad privies, emptying into a cess-pool only four feet by six in dimensions, which of course soon becomes full, and very often offensive to all the inhabitants, particularly to those into whose houses it drains. This requires immediate attention.

Jas. Barker's wife.

T. Rodgers's property.

Mr Allgate's yard, Furnival-Street, and an entry in Furnival-lane.

In the neighbourhood of Little Pond-street the houses are placed on a steep declivity, in the most irregular manner, forming exceedingly close yards with bad drainage from privies, imperfect ventilation, and a defficiency of light. There are two houses in Mr. Deakin's property into which privies drain, and tenants complain of the usual symptoms ; also other nuisances in Mr Hunter's property, Nag's-head-yard, of an exceedingly offensive character, reducing one person residing near to them to a miserable state of ill health. This person has recently lost a daughter who resided with her. Ill health prevails generally in this yard, where the surface drainage is of a most filthy description. Passing onward through Commercial-street and the Haymarket there is nothing requiring particular remark excepting the filthy privies belonging to the public houses. Surely the owners of these houses for the sake of common decency ought to appoint some one to cleanse them periodically, and modify the disgusting spectacle they now present. There are some fold-yards belonging to certain inns and public-houses, which instead of being used for cattle, &c., as usual, are complete cess-pools of stagnant water, and very offensive. Such places ought certainly to be drained into the main sewers, when not legitimately employed. We have now to speak of a subject upon which it is difficult to enlarge without a feeling of embarrassment, which is far from satisfactory ; but it is too true that the Killing Shambles, as they now exist, constitute a nuisance. They are situated on the banks of the two rivers, Sheaf and Don, with such an inclination that all refuse suffered to escape may readily be washed away. Notwithstanding their proximity to the rivers they are badly supplied with water, which is obstructed and diverted by a weir just

Little Pond-street.

Robert Saul's wife.

Privies belonging to public-houses.

Lower Tontine-yard.

Killing-shambles.

above, for the purpose of supplying works on the other side; this renders the side on which the shambles are built comparatively dry for the greater part of the year, with the exception of the waters from a main sewer, which empties itself just above; this sewerage water is of course too foul to be used for cleansing purposes; and consequently filth accumulates on the premises to an extent beyond description. Even should a portion of this filth find its way into the bed of the river, it there remains during the summer months, mixed with the contents of the sewer above-named to putrify,—to exhale noxious gases and engender disease wherever its influence extends. There can be no doubt were it not for the natural current of the stream being diverted by the weir, that the situation of these shambles is good, for the current would carry away all refuse and keep the bed of the river clean; water, too, might be constantly obtained, the premises cleansed, and a more sanatory state of the neighbourhood maintained. Their present condition, however, is so offensive as to strike every stranger who beholds them. Some improvement is absolutely necessary if they are to be allowed to remain in the centre of a populous district. The principal improvement that we should suggest is, first, the better paving of the lane leading to these shambles, and also the floors of the shambles themselves; secondly, an unlimited supply of water, either from the Water Company, or by means of pumps from the weir above, so that the whole may be thoroughly cleansed after each killing day; thirdly, a sluice, or some other means of conveying water from the river down the side of the shambles, to remove the accummulation therefrom; and fourthly, some regulations to prevent the retention of blood and refuse in this locality, which is now the practice to a considerable extent. Until more effectual means are taken, the latter object can be immediately obtained by at once conveying it to the outskirts of the town, and storing it for agricultural purposes. We find, from careful enquiry, that about 5,300 beasts, and 19,000 sheep, including lambs and calves, are slaughtered here per annum, and that they would yield about 180 tons of blood and other refuse useful for the growth of crops. The intrinsic value of this in its moist state, containing about 75 per cent. of water, would be about 10s. per ton, and the total annual value about £90.

Shambles.

Value of refuse.

It would be much better to incorporate this refuse with some dry vegetable matter, such as street sweepings, so that it might heat itself dry, as the presence of so large an amount of water would render the carriage too expensive. We should, therefore, advise that the police take it into their hands, and that they use it as a means of improving the quality of their street sweepings, which would thus attain such a value as to be easily disposed of with profit.

The houses in a great part of this district are of respectable construction, having their cellars dry, with the exception of some at the lower end of Arundel-street. Most of the houses in this street had formerly black sewerage-water in their cellars to a considerable depth, but since the construction of the drain they have become dry, a deposit, however, was left of such an offensive charcter that fever immediately commenced, and continued until the filth had been removed. Here there is also a police depot for the reception of street sweepings, &c., similar to the one in Wicker-lane, and which lies under the same objection.

High - street, Fargate, Division - street, Glossop - road, across to Ecclesall-road.

On inspecting the densely populated parts of High-street, Fargate, Division-street, Broomhall-street, and the streets situated south of these, we find them generally clean, wide, open, and well ventilated, the surface well paved and clean, but on proceeding farther west, where the buildings are of more recent date, and where we should expect to find great improvements, we discover streets in which no attention whatever has been paid to drainage, and where stagnant water is allowed to accumulate on vacant land till it becomes a complete mass of putrid filth. In the neighbourhood of Hanover-street, at the back part of it, for instance, there is about 300 square feet of stagnant drainage and saturated surface, capable of engendering fever and other epidemic diseases of the worst form. In Milton-street, a little lower down the road the surface is completely saturated, the evaporation from which is most noxious and injurious. There are many other smaller sources of malaria in this district, altogether capable of producing the malignant fever, with which it has recently been visited. Similar accumulations of stagnant water also exist between South-street and Broomhall-street, and between Fitzwilliam-street and Hanover-street, also at the corner of Milton-street, and between Fitzwilliam-street and Thomas-street: most of these are derived from the adjacent houses, being their surface drainage, which accumulated in clay pits to a considerable depth, and these forming very convenient ponds for destroying cats and dogs, and for the reception of such refuse as would be disgusting to the sight, if left to putrify in the streets, by this means they become complete cess-pools of all kinds of garbage, and being exposed to the atmosphere, are subject to change of tem-

Bad drainage and stagnant water on waste land.

How poisons are at one time produced, and not at another.

perature, dilution, and other causes capable of producing, during the process of decomposition, results as various as the causes which govern it. Hence we have at one time malaria produced, capable of engendering in the human system the worst form of disease, while at another, the exhalations from the same source are comparatively harmless. We may compare the change which animal and vegetable matter undergoes under different degrees of temperature, to those which take place in sugar of milk, under similar circumstances, the latter, at one temperature produces an acid, at another alcohol, and at a still higher temperature, a substance resembling mucus. Now, as it cannot be doubted, that these three substances would produce very different effects when taken into the system, so neither can it be doubted that as animal and vegetable substances form under different degrees of temperature, distinct chemical compounds, they would also affect the human constitution in a different degree. It has been repeatedly proved that substances in a state of putrefactive change, are capable of inducing a similar state of change in bodies brought in contact with them. A portion of putrid flesh for instance, applied to a fresh wound, often induces such a state of decomposition as to produce death. So likewise the putrid malaria escaping from these stagnant pools, may produce disease and death in a similar manner. That putrid matter does really escape with the evaporating water and gaseous exhalation from such sources as those in question, has been amply proved by Dr. Southwood Smith, and was stated by him in evidence before a Committee of the House of Commons. He passed the air from the neighbourhood of one of these pestiferous places through a glass tube kept cold by a frigorific mixture, so as to condense its water, which he found to possess the disagreeable odour of the place itself, and that a drop of it injected into the vein of a small animal, produced death with all the symptoms of putrid fever. This should be sufficient to induce all owners of property, where such places exist, to remedy the evil by adequate house drainage, and by filling up offensive pits, where drainage is found to be too expensive or impracticable. The contaminated air above mentioned, has manifested its effects during the past year, to an alarming extent. In that part of Hanover-street, most exposed to these exhalations, there were within that period six people lying dead of fever at the same time, we could not learn the exact number of cases, but it was very great. In Young-street there were altogether 21 cases of fever; in Thomas-street, Milton-street,

Dr. S. Smith's experiment.

Fever in these localities.

and in the immediate neighbourhood of these stagnant pools it was very prevalent. From the circumstance that the soughs of the houses situated in the lower part of Ecclesall-road, including those in Andrew's-lane, and in many adjacent yards, being completely stopped up with rubbish, we find the whole surface saturated with filthy drainage, which finally escapes into the cellars, producing the most horrid stench, and requiring removal from thence by buckets. It cannot be a matter of surprise with such a case before us, that scarcely a house in this neighbourhood has been free from fever during the past year. There were here 11 cases of fever, and one death in two houses, within that period, and six or seven deaths occurred on the opposite side of the road. In Bath-street, and in Canning-street, we also find very bad surface drainage and stagnant pools of an injurious character, all of which require immediate attention. Many of the courts and yards in this district are filthy from surface drainage and bad privies, as usual, unpaved, and subject to the evils resulting from the accumulation of filth. Some in Hanover-street are covered with stagnant water to a depth of several inches, on which account, those who inhabit the yard are occasionally compelled to use stepping stones to enable them to get in and out of the privy. One yard belonging to the houses of the Ionic Building Club has about 100 square yards of stagnant drainage, which is a great nuisance to this neighbourhood. There were ten cases of fever in this yard; three fatal. Most of the yards out of Young-street, particularly those on the west side, contain stagnant drainage, resulting apparently from its collection in the bed of a small stream which has been diverted from its original course for manufacturing purposes. When such is the case, it is important that the old bed of the stream be filled up, in order to prevent such accumulations as we find here. There are other yards in which we find bad drainage from privies and pig-sties, many of which are complained of by the inhabitants as being very offensive from the odour they produce and the filth they create. We remarked one in Young-street particularly. There is, on the contrary, one or two yards in Trafalgar-street where sanatory measures have been attended to, and we would recommend builders to examine these yards, and the effect they produce, that they may adopt similar plans. It appears that in this district the most extensive evil, though apparently not so destructive of life as that caused by the sufferance of stagnant house drainage and the malaria thence exhaling, is the prevalence of privy drainage into houses,—privies too near houses,—and the

Ecclesall r

Courts and yards, stagnant water and bad drainage.

erection of rooms over privies. There is no instance where people are exposed to the influence of this filthy drainage where they escape without an attack of illneess. Many suffer from low fever; others from a slight sense of languor and loss of appetite; and the health of all is more or less affected. In Godfrey Chapman's yard, Jail-street, there are four families suffering from drainage of this kind and from their doors being fully exposed to the vapours emitted from the places themselves. A kitchen floor of a house situated in Woodman's Inn-yard, is completely saturated with such drainage, and requires constant cleansing to make it bearable. There have been eight cases of fever and one death in this house. The inhabitants have been suffering from fever for some time. One yard, at the upper side of Ecclesall-road, contains a house into which three privies constantly drain. The parties who occupied it were obliged to leave in consequence. It is in this yard that six deaths out of the seven, stated to have taken place in the upper part of Ecclesall-road, occurred. There are many similar cases in Fitzwilliam-street, where fever has been prevalent for some time past. In Mr. Sidebotham's yard, there have been thirteen cases of fever within five months; and in the adjoining yard three or four. Here we find a large public privy, situated under a workshop, and exceedingly close, intended to accommodate three separate yards. Nothing could be more disagreeable than being obliged to reside in close proximity to such a place as this. In Rose's yard, we find a house unoccupied from being situated over a privy. Others receive drainage of a most offensive kind. In one instance the parties have dug a hole in their cellar to receive it, and are obliged to convey it away constantly in buckets. In Hatfield's yard, Hunter's yard, and No. 6 Court, we find most offensive privies, which pour their drainage into the neighbouring houses to the prejudice of the inmates. In the last named, beneath two bed rooms, are two privies, one of which has burst into a cellar of an adjoining house. There are many people ill in this neighbourhood; there is also one in Stacey's yard, Button-lane, draining into a house, the inmates of which are constantly suffering from its effects; the wife has been ill ever since she came, and will be obliged to leave as soon as possible. In Canning-street and Carver-street there are also several instances of bad privy drainage, and of injury to health by its proximity. There are two or three families in Mr. Coward's yard, corner of Division-street, constantly suffering from low fever, and attribute their illness to privy and

J. Ward's wife.

Woodman's Inn yard.

Fitzwilliam-street.

James Staniforth.

other drainage constantly accumulating in their cellars. These are all instances which might certainly be remedied by more efficient drainage, and by selecting a proper site for the privies. It is astonishing, however, in many instances, how little care has been bestowed in this respect, and how many have been placed adjoining houses under workshops or dwellings, into the whole of which their exhalations must pass. It is quite impossible that such habitations can be tenanted for any length of time; if they are, the landlord cannot get his rent. Returning to the disagreeable subject, we have to notice several privies injudiciously placed. In Canning-street one so much so that the tenant of a house is obliged to pass through the privy door to get to his room above. All the air which supplies the family must become impregnated with noxious effluvia, and must be a source of disease to all who inhabit it. The husband and wife in this case have constant ill health. There are also many privies situated under shops in this locality, all very objectionable. Two houses in Chester-street receive drainage from privies, and some of the inmates suffer in the usual manner. Hilyard's yard, Carver-street, contains two houses receiving privy drainage of a very bad character, producing constant illness. Several yards out of Fargate are in a similar condition, or are so filthy from accumulations of refuse and drainage that they are decidedly unhealthy. In Mr. Atkinson's property, a privy drains into a house where three children have recently been laid up of fever. A similar drainage takes place from a yard in Back-fields into a house in Mr. Osborne's yard, in which all the family have been consequently ill. In Mower's yard the privies are very offensive. Ashes have been thrown out and left, and drainage passes into some workshops below. Perhaps the worst instances of privy drainage and accumulation of filth in this district are found in the closely-built property in Burgess-street, Cross Burgess-street, and Coalpit-lane, and the property contiguous to St. Paul's Church. We found in this district small ill-ventilated houses and courts,—some of them exceedingly filthy, and occupied by tenants who have little care for personal or domestic cleanliness. In Chequer's yard, for instance, at the bottom of Coalpit-lane, the small dilapidated houses are occupied by Irish families, who gain a living by hawking matches, door mats, fire wood, &c., and who have scarcely any furniture in the house, and in many instances not a mat to lie upon. All kinds of filth accumulate in this yard, until it is difficult to approach without contamination. Spurr's yard above is very little

R. Brown's property.

Fargate.

J. Bush.

Burgess-street, Coal-pit-lane, &c.

Chequer's yard.

Spurr's yard.

Cricket yard.

Geo. Lister's wife, &c., in R. Young's yard.

Mary Greaves' house.

Rodgers, tailor.

Yards out of Fargate (South).

B. Marsden, tailor.

Harriet Wright.

better: in fact the privy drainage in this place actually finds its way down the centre of the yard and into the houses in a stream. Cricket yard contains privies of a most filthy character, draining into the houses in Scott's yard below. We could learn nothing as to the sanatory state of this district, as we found the tenants of this locality seldom remained more than a week. There is one exceedingly close yard in Cross Burgess-street, being only about 24 yards long by 11 broad, containing two double houses, five single ditto, and five out-kitchens, with privy under sleeping room, vilely offensive. There is constant illness in this place among the adult inhabitants, and many deaths among young children; the rooms too are low, and the supply of light and air very imperfect: the cellars constantly contain filthy water, which is pumped out and used for washing the yard; the smell from this water is very offensive, and we cannot conceive a much less desirable place of residence than this; for, exposed as its inmates must be, to the noxious effluvia from the water in the cellars and the close privy, deprived as they are of a nominal amount of light and air, the weaker of them must soon suffer in health, and premature death be the lot of all. Taylor's yard and Davis' yard in Cross Burgess-street are exceedingly filthy from accumulations of night soil, and from surface drainage of the worst kind. In the last named place there is constant drainage into one of the houses, producing illness in the occupant. There have been three fatal cases of fever here amongst a number of others which have terminated favourably, within a very short period. Certainly the owners of this property or their agents should insist upon such pestiferous accumulations being removed. There are also families in Mr. Sellar's yard, and in No. 6, Court, Burgess-street, suffering from bad drainage and from their bed-rooms being placed over privies, and many yards out of Fargate are in a similar condition. In Darwin's yard, for instance, and Sykes' yard there are filthy accumulations and very bad drainage to a considerable extent. One house in the former yard receives privy drainage from the adjoining yard, and the tenant has been ill of low fever, and child is laid up with the same at the present time. Another in the latter occupied by two widows is actually in the centre of a manure heap, receiving its drainage and putrid exhalations continually. Several families complain here of the nuisance, and attribute their bad health to its existence. There are also large accumulations of filth and bad drainage in the back part of Cheney-square; the privies, &c., are exceedingly dirty, their contents drain into and run down the centre of a small narrow lane, and also into several yards and houses at the lower end. Some immediate measures are certainly required here to preserve the lives of the inhabitants, for the whole may be described as a large cess pool; and it is obvious that the exhalations from so extended a surface must be very considerable, and likely to produce the most fatal results. Most of the Courts and Alleys out of High-street and Fargate are exceedingly close, badly lighted and ventilated,—the privies generally being full, and placed in bad situations. In one or two instances they drain into houses, producing the usual symptoms in the inhabitants. In the whole of this district we found very large accumulations of night soil, which could not be disposed of, without previously paying for its removal. In the bottom yard in Carver-street there could not be less than 20 or 30 tons, which must have been accumulating for some time: it is absolutely necessary that some steps should be taken to insure the removal of such refuse, and to apply it to profitable purposes. Continuing our inspection on the west of Division-street and Fargate, including all the property extending to West-street and Church-street, we are brought in contact with some of the oldest and worst kind of buildings in the town. The houses in the central part of this district, particularly those in the neighbourhood of Orchard-lane, and those in a line drawn thence parallel with West-street, as far as Rockingham-street, are exceedingly old, often dilapidated, and occupied by the lowest class of inhabitants, and in many parts are so closely and irregularly packed together as to preclude the possibility of the free access of light and air: the rooms are low, the windows of which are occasionally provided with but one casement, and that often immoveable, so that the most common method of ventilation is impracticable. The yards formed by these houses are generally very close and filthy from the careless habits of the people, and the only effectual remedy for this state of things would be the removal of such property, and its replacement by new and better constructed houses, provided with more commodious and open yards.

King and Miller's yard, Norfolk-street.

Foster's yard, High-street

Accumulation of night soil.

With the exception of Rockingham-lane, West-hill-lane, and part of Orchard-lane, the streets, &c., have generally a clean appearance, but the lanes above-mentioned are full of refuse and saturated with filthy drainage.

Privies and filth in yards.

We here again find the evil effects produced by placing privies in bad localities: for instance, there are two in Dawson-street draining into cellars in the manner so often described.

Mr. Newbould's property.

Mr Middleton's property. Another which accommodates the inmates of 9 houses, and a considerable number of workmen, is placed at the back of 3 houses, all of which receive its drainage, which often makes its way hence into the street, causing a most offensive stench, and producing the usual symptoms of low fever, dysentery, &c. Jos. Hibbert. Another privy drains through two houses at the top of Orchard-lane, with the like results. There are also several cases in this district where these receptacles diffuse their drainage over yards, and are otherwise exceedingly offensive and injurious. This is particularly the case in Balm-green, Mr. Young's property. in Court 5 and 6, Holly-street, and in a yard between Orchard-street and Smith-street, Mr. Sheldon's property. whose inhabitants are more or less affected by fever, &c. In Favell's yard there is a privy accommodating the inmates of 11 houses and about 16 work people, and is in a most filthy state: the yard itself contains upwards of 10 tons of refuse, principally cinders, not worth carting away for agricultural purposes, without undergoing the process of sifting, which the inhabitants are either unable or unwilling to perform. In Smith-street there are 12 houses Mr. Sheldon's property. having a yard behind them not more than 5 feet broad, and very filthy from house drainage, &c. Here we were somewhat puzzled, for having an impression that the demands of nature upon our animal economy were uniform, we could not imagine how the inhabitants of these houses could do without so necessary an appendage to them as a privy; so far was each family from being provided with one, there was not even one amongst the whole twelve.

On examining the district commencing at the top of Townhead-street, and including the boundary formed by Tenter-street, Westbar-green, Westbar, Snig-hill, Angel-street, High-street, and Church-street, we found the back lanes, and many of the smaller streets, densely inhabited by the lower orders, generally, including a great number of Irish, whose quarters are commonly filthy above the average. The streets mentioned as forming the boundary of this district, are generally cleanly, well paved and drained; but many of those branching thence, particularly Lee-croft, Hawley-croft, School-croft, and Sims-croft, are exceedingly steep, and have generally a badly paved road surface. The narrow lanes and courts in this district are of the worst possible description, being exceedingly close; and in the case of Scargill-croft, tenanted by profligates of all descriptions, the houses are low, often dilapidated, and badly supplied with light and air. Many of these serve the purpose of lodging-houses, in which congregate vagrants of every kind. The general disregard to cleanliness observable in these, and such as these, will account for the untidy appearance which this part of the district presents.

Privies and filthy yards.

The yards in this district present the usual appearances, being unpaved, the soil often saturated with drainage, and very filthy from accumulations of night-soil and rubbish. There is one in particular in New-street, in which night-soil is piled at the back of some houses, to a height of six or seven feet, completely obstructing the road to the privy itself, which is full and offensively dirty. The drainage from this pestiferous heap into the adjoining houses, is abominable, and the stench which must enter the windows directly over it, when any attempt to ventilation is made, is no less so. Here people complain in the usual manner. In this street, directly opposite, are to be found some ruinous houses which appear to have served the purpose of the aforesaid obstructed privy, being in a most unusual and disgusting condition. Surely the owners of such property ought to adopt means to prevent such abuses, too often not confined to an exhibition like this, since such buildings not only afford hiding places for thieves, but they answer the purpose of the licentious and dissolute: there is similar property at the back of Black Lion yard, Westbar.

Mr. Hague's property.

Mrs. Baxter's.

Mrs. Binns's property.

The privies in Scargill-croft are all badly placed, often full and extremely filthy; but the inhabitants of this locality are living so depraved and besotted a life, that they appear to be perfectly insensible to any effects upon their physical and moral health, produced either by the bad air they breathe, or by the bad habits in which they indulge.

One privy in Black Lion yard accommodating the tenants of several houses, is frequently so full as to be useless, and there is always great difficulty in getting it emptied. Another has been erected over a large vault or cellar of an inhabited house in Bank-street, which receptacle, opening upon the Black Swan yard, we are informed, had not been emptied for six or seven years; a nuisance of the most intolerable nature.

Mr. Ironside's yard.

Another in the Three Cranes yard, in the same street, is very badly situated, and drains down the yard close to the door of the inhabited houses. Another, and that abominably filthy, is situated in Court No. 7, Silver-street, which is very close, ill paved, and with the houses altogether of a dirty character. And here we must also mention Paradise-lane, as it contains accumulations of night-soil and stagnant pools of drainage, the soughs being stopped up, and its inhabitants afflicted in the usual manner by typhus, low fever, &c. Nor

Mr. Jervis's property, Hall tenant.

must we omit to mention a house which receives drainage from the privies attached to Queen-street Chapel; this drainage is sometimes mixed with water from the graves, which is poured into the cess-pool, and thence runs in streams into the house in question; family constantly afflicted, but cannot leave from being backward in their rent.

Of Lee-croft, Hawley-croft, School-croft, and Sims-croft, we may remark generally, that the houses are irregularly built, though of a respectable construction. Many, however, are dirty, as also are the yards in this locality.

Sims-croft.

The mass of buildings in Sims-croft, particularly those at the lower end, are of a meaner character than the former, and are inhabited principally by Irish. A privy situated in Sargent's-yard, Lee-croft, is very dirty, being covered with ordure, and the only accommodation for the occupants of 18 houses.

Bright's-yard.

Bright's-yard, in which scarlet fever prevails, and in which six deaths have occurred in less than 12 months, contains an immense quantity of night-soil and ashes, (the accumulation of two years,) which prevents all access to the privies, which, also, from want of being emptied periodically, empty themselves, and spread half over the yard. It is no wonder, therefore, that four medical advisers now attend the sick here, a part of whose advice we learned had invariably been, —"leave the locality,"—which advice, from being backward in their rents, the poor sufferers have been unable to follow.

Mr. White, deputy.

Surely, landlords must be ignorant that such a state of things exists, for it is manifest that it must materially affect the value of their property, the management of which is unfortunately left to agents, who appear to make the collection of the rents their business, so far as to exclude all thoughts of such unimportant matters as cleanliness and tidy habits in the tenants.

Saml. Bishop's property.

There is a privy in Hawley-croft, built at the back of two houses, into which it drains, affecting the health of the inhabitants, one of whom has never been well since she resided there. This individual is respectable, and her house gives evidence of tidy habits, so that no suspicion of disease, arising from any other cause, can exist.

Ann Greenwood.

The Lamp yard is saturated with privy and house drainage of the worst kind, in fact, most of the yards and houses on the west side of Hawley-croft, present a filthy and unwholesome appearance. That the locality is generally unhealthy, is proved by premature old age, fever, &c.

Mrs. Gallimore.

Mr. Beet.

We have some satisfaction in stating that though there was but one privy to 18 houses, in No. 4 Court, and a double one to several houses in No. 10 Court, the first was kept scrupulously clean by the owner;

and the latter no less so, by an agent appointed for that purpose,—a practice we should certainly recommend, as one immediate remedial measure. There are open privies at the bottom of School-croft, which we cannot notice with similar satisfaction.

There is a yard in Sims-croft thoroughly saturated with putrid drainage from cow-houses, &c., situated in School-croft, "enough to breed a fever;" but one of the greatest nuisances in the neighbourhood arises from the building of privies on the flat surface, with little or no receptacle for the ordure, so that in a short time it absolutely runs and extends itself over a considerable portion of the yard. There is no palliation for such gross negligence as this.

Thompson's yard.

Mrs. Booth's cow-houses.

Thompson's yard.

In consequence of the value of property in High-street and Angel-street, it has been too closely built upon, and the yards are incommodious and unwholesome; and though the privies are inconveniently situated, they do not drain into houses, nor do they appear to produce the effects observable under other circumstances. There are privies badly situated and filthy from their position in Watson's-walk, Hartshead, and Campo-lane. In this locality are also several large accumulations of night-soil, which ought to be removed. One privy in Watson's-walk is most abominably filthy. There is a yard between Hartshead and High-street defiled by pig manure and privy drainage, which appears, however, to create no disquiet to the occupiers, however other people's olfactories may be offended. On the property belonging to the Girls' Charity School in Campo-lane, the spectacle is exhibited of a privy placed in the centre of a row of *new* houses, having chambers over it, and cellar kitchens adjoining it, which occasionally receive its drainage, not at all to the satisfaction of the occupants thereof. These disgraceful arrangements appear to arise from too great a desire to reap as much benefit as possible from small building property, which invariably in the issue proves futile, from the experience of persons suffering from the loss—always of comfort, and sometimes of health—which experience has a tendency ultimately to lower the rents. There is also property at the top of Campo-lane in a most offensive condition from stagnant surface water, drainage from manure heaps, &c., and here we again find a privy of the most loathsome description. Here it appears that several houses are untenanted—and no wonder. As to the general character of the inhabitants, the observations we have occasionally made in this district will furnish a sufficient idea; but the observations are obviously limited to a certain

Mr. Binney's property. Hartshead.

Grey Horse-yard.

class, as a great part of this district is inhabited by respectable individuals, principally connected with the Sheffield trade.

In the districts included between West-street and Broad-lane, extending from the neighbourhood of Glossop-road to Townhead-street, the buildings are placed upon a surface gently inclined towards the north, and are, with the exception of those in the neighbourhood of Bailey-field and the lower part of Trippet-lane, of a better construction than ordinary; the latter are very old, and lack both light and ventilation, and the inhabitants are in low circumstances, and principally engaged in the Sheffield trade. This district is intersected by streets of an irregular and inferior character, and often by lanes, courts, and passages of devious and squalid appearances, particularly those at the lower end. The surface and underground drainage appears to be effective; and, with the exception of Trippet-lane, presents the general appearance of cleanliness.

Trippet-lane.

Woodhouse-lane—a lane east of Regent-street—and other narrow passages, are filthy from accumulations of all kinds of refuse and drainage. And Red-croft, besides being nasty, is for the most part inhabited by dissolute characters. In Bailey-field, which contains upwards of 1000 inhabitants densely crowded together, we find the houses very inferior, and erected in courts running from one to another; the inhabitants suffering illness arising from causes so often mentioned. There are four houses in Smith's yard receiving drainage from privies to the great detriment of the health of the inhabitants, two of whom are laid up of fever, together with another in Cowper's yard below. In Waterhouse's-yard, Fenton's yard, Earnshaw's yard, and two others, are privies of an offensive character. The yard below Waterhouse's-yard, principally inhabited by Irish, contains an immense accumulation of night-soil and ashes; its whole surface being exceedingly filthy therefrom. The fault of building only one privy to several dwelling-houses is here carried to an extreme; and the reflection is lamentable, when it is considered that the difficulty of getting these places emptied, which always exists under the most favourable circumstances, is greatly aggravated, and more frequently incurred, from the rapidity with which they become full.

Bailey-field.

Branson's-yard, 18 houses to one privy; also, in Bailey-lane, in Mr. Staniforth's property, Rockingham-street, and in Newcastle-street.

In Newcastle-street, where the drainage is imperfect, there is a privy which drains into the cellar of a house up the walls of which its contents are drawn by capillary attraction; to remedy this evil a sough was constructed through which *rats* have been drawn (by another kind of attraction) and with dirty feet defile every thing they come near. There is also a sleeping room over a privy in this yard, and a great deal of ill health prevails. Ten deaths have occurred within a very short period out of about twenty cases of fever, which has appeared in almost every house in the neighbourhood. The same illness also prevails in Rockingham-street, where instances occur of privies draining into houses and bed-rooms over the privies. There is also a very filthy and exposed cess-pool in this street, which drains into an adjoining lane. In Thornhill-lane there is a privy intended to accommodate 12 families producing the double effect of poisoning the atmosphere of a sleeping-room above by its exhalations, and of saturating the cellar floors below by its drainage: this operation has inflicted fever on four individuals, and a heavy expense on the parish to which they belong. There is also a slaughter-house which is a great source of offence and complaint in this neighbourhood; and this with bad drainage and other similar sources of malaria is undoubtedly the cause of the prevalent sickness. At the end of a row of houses in Orange-street there are two privies, each under a dwelling-house; these houses we are glad to record are unoccupied, and were this always the case another and a more reasonable plan would be adopted. Arrangements of a similar kind occur in Portobello-street and Brown-square; in the first place the privy accommodating 12 families, and in the latter 9 families resort to the same convenience. Unfortunately the houses here are tenanted, and some of the inmates are now suffering the usual penalty. The general character and habits of the inhabitants of this district may be considered good, with the exceptions to which our previous observations have been applied.

Staniforth's property. Bearden's yard.

Matthew Taylor, wife, and family.

Mr. Cowley's property.

Copley's yard and Brown's property. Jas. Milner's wife, and J. Younge's child.

Carrying our investigation into the district bounded by Beet-street, Upper and Lower Allen-street, Gibraltar-street, West-bar-green, Tenter-street, and Broad-lane, we find it more densely populated in relation to its extent than any district previously mentioned. The circumstances of the inhabitants here are generally of a more uniform character; they being chiefly engaged in various branches of business connected with the trade of Sheffield. The houses, especially those erected in the yards (which are of a very confined character), are ill constructed, badly lighted and ventilated: being built back to back, and generally of three stories high, which of itself is an impediment to the free access of light and air; and from the accumulations of filth and bad drainage in the lower part of the district the atmosphere is loaded with miasma to a degree which is highly pernicious; no wonder will be expressed at this after the perusal of the details which follow. The streets, with the exception of Garden-street, White-croft, and the lane between Solly-street and New Edward-street, though not all sewered, are kept clean by their natural inclination. The lane before mentioned demands our special notice, receiving and retaining as it does the drainage from houses and privies in Solly-street, in several places to the depth of two feet, which soaks in and reduces the surface to a complete quagmire, making it a fertile source of the disease and death which prevail around. Sixteen cases of fever and one of death have occurred in the adjoining houses within a few months, and four cases of fever and two deaths in houses whose windows are directly opposite to the point where drainage from this lane escapes into Edward-street. It is worthy of remark that no such cases have occurred in places further removed from this vicinity; the inference in this instance is irresistible.

The cases of privy drainage are so numerous in this district, and our observations on the mischievous character of this nuisance have been so frequent that we shall content ourselves with merely mentioning the localities where such nuisances occur; simply premising that in all instances complaints accompany the existence of the evil. A house in Wheeldon-street receives the drainage from an adjoining privy; the tenant's wife and children suffering from dysentery and other illness. Those in the next house afflicted in a less degree. One in Broad-lane deposits its drainage close to the door of a dwelling-house, producing similar effects upon the tenant's family: one son died lately of typhus fever. Another just below drains into a house, making the residents feel the usual effects, the tenant and his family being laid up with illness, while their four sons who work from home are in good health. Two more drain into a house, No. 14, Court, Broad-lane, which is in consequence justly unoccupied. One draining into a house in Garden-street has compelled the tenants to seek refuge from illness in the Workhouse. One situated in the Royal Oak yard, Tenter-street, drains into a house which has been for some time unoccupied, now, we believe, tenanted, though we suspect not for long, as we understand no one *can* remain there. Another drains into a house in No. 4, Court, Hollis-croft, producing the usual symptoms on the tenant's wife: the parties cannot leave, being backward in their rent. A house in this yard receives drainage from a privy situated at its back, and the tenants are confined with fever. Four houses in No. 12, Court, White-croft, receives privy drainage from the yard above, and the tenants suffer as usual: one of them previously

Mr. White's property.

Wm. Tor's family.

Mr. Jeeves's property.

Wm. Hartley.

J. Cudworth.

John Holmes.

Joseph Scorah's wife, and Andrew Tankard's wife.

in the enjoyment of good health, has never been well since he resided there. Two houses situated in Court No. 5, White-croft, receive drainage from privies in adjoining property, making the wife of one of the tenants ill. A privy situated in this court drains into a house in the yard below. A privy also drains into a house in Court 7, White-croft, occupied by a family of seven, who enjoyed good health until they tenanted it, from which time, a period of three months, the whole family has suffered from illness more or less.

Josiah Platts and David Hague.

MrHinchliffe's family.

A privy drains into two houses in Court 1, Pea-croft, and renders the cellars quite useless, the tenants in one of them suffering from illness. Another privy drains into a house, in Court 2, Pea-croft, but in this case the odour is so offensive that the house is never occupied for a long time together. Another in Court 11, Pea-croft, drains into the house adjoining it, here the tenant's wife has been confined to her bed for a long time, and the tenant himself lost so much time that he could not pay his rent, and has been sold up in consequence. This was formerly a respectable workman, well to do in the world, but from the above cause has been reduced to great distress. Others in Parkin's yard, Pea-croft, drain into two houses, where the tenants have been laid up with illness for 11 weeks, and both their wives are suffering from low fever, and are Infirmary patients at the present time. Another drains into a house in Mr. Truswell's property in Pea-croft, producing the usual bad effects.

Ibbotson's property.

Thomas Gregory.

There are also many instances of a similar character in Scotland-street, and in the property extending from thence down to Gibraltar-street; for instance, one in Denton's yard, Scotland-street, and another in Pearce's yard, drain into the houses adjoining them—and the tenants of the latter are suffering in the usual manner. Another in the Barrack yard, Pea-croft, drains into a shop and house in Scotland-street, to such an extent that the shop has sometimes been two feet deep in filth, ten of the family of the present tenant, all young children, have died in this house—and the husband and wife have generally ill health. This abominable nuisance has been repeatedly complained of to the deputy landlord, but without producing the least effect. Another privy drains into a house in Cross Smithfield, producing the usual symptoms in the occupant, the former tenant left in consequence. Another drains into a house in Marriott's yard, all the family have been suffering more or less from illness, are backward with their rent, and cannot leave. Another at the bottom of Cupola-street drains into the house adjoining it,

WilliamKing's shop.

White, deputy.

William Snidall's house, from Mrs. Dixon's property.

Chas. Fowler.

and here also the tenants are suffering from constant ill health in the usual way. Another drains into a house in Furnace-hill, where tenant's wife is constantly affected by it, she has resided here only three years, and has lost three children during that time. Another in Trinity-street is in a similar condition. Here, then, are about 25 families suffering from this abominable nuisance in this district alone, a circumstance which calls loudly for some interference on the part of those who consider the preservation of health the greatest boon to the country. There are other nuisances, however, in this locality, quite as numerous, and almost as injurious as those above described. There are many places where those pestiferous cess-pools, middens, and privies are situated under dwelling-houses and sleeping-rooms, into which their poisonous vapours can readily pass. Other instances, where they are situated in close yards, the surface being saturated with the drainage, and so near to the doors of the houses, that the tenants are no less exposed to its effects; in many instances the mass of matter collected in these places is so great, that the proper receptacle is incapable of containing it, when it spreads over the yard itself, being a source of constant filth to the dwellings, and of disease to the inhabitants.

Mr. Ellison's property.

Marples's yard.

Court 2, Hollis-croft, is exceedingly close, and one of the worst we have seen. The houses, which are three stories high, enclose it on all sides, rendering it impossible for any fresh air to get into it, excepting that which is drawn by the fires of the inhabitants. The cess-pool here is generally full, and the accumulation of refuse so great that the house adjoining is seldom occupied and scarcely tenantable. It is a remarkable fact, that scarcely any of the children born in this yard, who were attempted to be brought up, came to maturity, for out of the four houses which it contains (one generally empty) no less than 30 children have died within the last 40 years; the adults, however, do not appear to have suffered so much, as only five deaths have occurred amongst them during this period.

Law's yard.

Court No. 2, Solly-street, privy with large vaults full of night-soil, with dwelling-house over it, the tenant of which recently died of consumption,—family state that when the doors and windows are closed during the night they are nearly suffocated.

Court 11, Hollis-croft, is also very close and dark, the privy being as usual in a very offensive state: the inhabitants here look pale and thin, and fever is by no means uncommon.

There have been four cases (two fatal) within a very short period. A very close yard in Silver-street-head contains a privy covered over with buildings, and closely adjoining a house. The family here consisting of husband, wife, and two children, are suffering from constant ill health, have become backward with their rent, and cannot leave. We were informed that three other houses in this yard were in a similar condition,

Mrs. Evinson's yard.

Saml. Fearns's family.

Nearly the whole of the yards in Lambert-street contain a large accumulation of night-soil, and are otherwise filthy and offensive. Favell's yard and Court 4, White-croft, are very filthy from bad drainage and saturated surface, and fever has been very prevalent among children. Court 5, Pea-croft, is exceedingly close, the rooms of the houses low, dark, and ill ventilated; a privy here, which is perfectly full, is exceedingly offensive, and the house drains are bad. Eighteen persons were all recently afflicted with fever in this yard at the same time, and on two occasions during the last fifty years, every inhabitant suffered from the same disease. One tenant has lost the whole of her children, nine in number, during her residence here. Court 11, Peacroft, is also in a similar condition to the above—rooms in houses exceedingly low, and eight cases of fever here at present. There is a very offensive privy under dwelling-house in Court 15, Edward-street, which has been a the cause of constant illness to the tenant's wife; her medical adviser has very wisely ordered her to leave. Another, very badly situated with respect to houses, in Court 2, Allen-street, is placed under a dwelling-house which is fortunately unoccupied. Another in Cross Smithfield, of a very offensive character, producing constant illness to the occupants of the dwelling-house above, as well as in those situated too near to it in the house below. Another in the lower part of Cupola-street has been placed with so little consideration for the health or comfort of those near to it, that it drains freely into the adjoining house, and evaporates into the chamber above, and altogether is so pernicious, that the late tenants, both husband and wife, died from its effects.

Hatfield's yard. Wm. Reed and Hy. Horton.

Jackson's yard, Allen-street, contains a double open privy, intended for the accommodation of 21 families: it is exceedingly offensive, draining into the yard, and saturating the soil to a considerable extent; nearly every house in this yard has been visited with fever, and nine or ten children and two young men have died within the last two years. Others in Rowbottom's yard, and in Court 12, Allen-street, intended to accommodate eight families each, cannot be otherwise than filthy in their character, and both morally and physically injurious in their effect. The same remarks apply to those in Sanbourne-square. Another privy in Court 3, Edward-street, is placed in such a situation that it drains and evaporates into the adjoining houses, and is a source of constant disease. Fever is here very prevalent among children, three of whom have died within a very short period, and many others have been afflicted. Ten children out of a family of 14 have died in the house nearest to the privy, and of the four survivors none were born during their residence here. The Asiatic cholera was also very bad in this yard, and three cases of death occurred. In Courts 25 and 26, Pea-croft, there are also very filthy accumulations of rubbish and badly saturated road surface, and there is a dilapidated and filthy privy in a yard just above. We regret that the owners of this property in particular, after being remonstrated with by the tenants, should allow such a disgraceful state of things to be continued. There are also several instances in Scotland-street and Allen-street of large accumulations of night soil and bad drainage close to the houses of the inhabitants, who are constantly suffering from its effects.

James Lee's family, five born in Derbyshire, four of these living; *youngest died on coming* to this house.

25, Mrs. Burgin's property. Privy on Mr. Kuowles's property.

Holdsworth's yard, Scotland Street. Ellin's yard, Allen-street.

Tank in Furnace-hill.

There is one more very offensive nuisance in this district which we think requires immediate attention and removal. It is a large open tank or cess-pool in Furnace-hill, constructed to receive the sewerage water for the purpose of supplying a steam engine; this now contains a large quantity of thick mud and water, which being in a constant state of fermentation emits noxious gases and vapours which pollute the atmosphere and injures the health of the inhabitants of the neighbourhood; we were informed that the attendance of a medical man was constantly required by some of them, and that children were very much afflicted with ill health. It would indeed be remarkable if it were otherwise, for noticing, as we had frequently done during our inspection, the fatal effects produced by such places, we could not avoid concluding that we might reasonably expect that some time or other malignant fever would exist here.

Such, then, is the deplorable state of things presented by a portion of the town which (in consequence of the density of its population), of all others, requires the greatest attention to cleanliness and pure air, but both are recklessly neglected; even tallow chandlering and neat's-foot oil making are carried on here, emitting the most offensive odours, without being complained of as nuisances by the inhabitants, they appearing, in fact, to have become so habituated to such nuisances as not to be aware of their existence; such an unnatural state of things is certainly calculated to produce a depressing effect upon the moral and physical condition of the people,—to engender carelessness for domestic comfort, cleanliness, or self-respect, and materially interfere with the welfare of all who are exposed to its influence. This is fully borne out by the general appearance and character of the inhabitants and of houses many parts of this district.

The north-western portion of the town, commencing at St. George's Church, extending towards the river Don, and including all the property west of Allen-street, is of more modern construction, and built principally upon a clay subsoil of a retentive character. This clay has been frequently removed to a considerable depth, producing pits which have been again filled up with porous materials, to form a level road surface. Many of these pits receive the house drainage, and ultimately become saturated, offensive, and injurious to health. The streets here are often badly arranged with respect to aspect and inclination; and several of them present a very bad road surface, and contain stagnant drainage to a considerable extent. Leicester-street, for instance, contains an accumulation of all kinds of rubbish, and is occasionally impassable for mud. This neighbourhood was visited a short time ago with a most malignant fever, which carried off many of its inhabitants. Hammond-street is perfectly saturated with house and other drainage which renders the houses damp and uncomfortable, while St. Philip's-road and Upper Wentworth-street have such a retentive and irregular surface that they are foul and offensive.

In Ellis-street and its immediate neighbourhood, where the clay pits have been filled with porous substances, we find accumulations of refuse and saturated ground to a very great extent, the drainage of which escapes into cellars and houses, and becomes a constant source of putrid vapours and noxious gases, producing their usual effects upon the inhabitants, a great many deaths consequently occur here amongst young children. There is also a clayey piece of ground between Suffolk-street and Henry-street, on which putrid drainage is allowed to accumulate, and to diffuse its vapours in the atmosphere around. Many other places of a similar character, though of a smaller extent, exist in this neighbourhood, which are equally objectionable and injurious to the health. We may mention the neighbourhood of Well Meadow-row, as being covered with filthy water, which soaks into the soil; and as containing an open drain of a very pernicious character; nine or ten families in the immediate vicinity of this drain have been afflicted with typhus fever during the last year, and general ill health prevails. The yards in this district are generally open and freely exposed to light and air, though few are paved or drained in such a manner as to prevent absorption and retention of filth. The houses are of a better construction than ordinary, the rooms being generally lofty, and occupied by the more respectable portion of the Sheffield artizans. Many yards, however good they may be in other respects, are often rendered unwholesome by offensive privies and bad drainage in the usual manner. At the top of Brook-lane, is a yard containing a covered cess-pool, which, receiving the drainage from the privies and houses adjoining, is periodically emptied by means of a pump, and its contents are allowed to run down the street, producing the most abominable stench. The inhabitants complain very much of the bad effects it produces upon them, and consider it an intolerable nuisance. There were two cases of malignant fever (one fatal) in the house adjoining, during the past year. This is one out of many instances where people will not avail themselves of a good main sewer, when it is close at hand, and where suffering and death have been the consequence of such culpable neglect. Privies also drain into two houses in Brook-lane, in one of which the smell is so offensive, that the tenants intend leaving without delay. The other has been occupied by the same family for 11 years, during which time, three of the children have died of fever, and both husband and wife suffer from constant ill health themselves; they are not so fortunate as their neighbours, but have become backward with their rent, and cannot leave. Another privy in Leicester-street drains into a yard and saturates the soil, where several families are suffering from illness produced by its exhalations at the present time. Another drains into a house, and is otherwise exceedingly offensive in the same street, where 12 cases of fever have occurred. The tenant of the above house had a very severe attack of fever, but recovered, four others died. These cases of bad drainage, combined with the filthy nature of the street itself, are quite sufficient to account for the unhealthy state of the district. There are also several yards in Radford-street and Allen-street, in which the air is either polluted with exhalations, or the soil sodden with drainage so as to be equally injurious to health. Court 2, Bedford-street, contains a very bad privy itself, and receives drainage from others above. One family of 10 in

Thos. Smith.

George Lee's family.

Vicker's-yard.

John Green.

Lee's houses.

Drains from Shipman's yard.

Henry Hewitt.

number, suffer in the usual manner. Another privy is placed so near to a house in a yard lower down, that the tenant's wife is suffering from illness in consequence. Another in Court 17, Allen-street, where the houses are very inferior, drains into Well Meadow-row, and in conjunction with other filth saturates the soil, and converts the whole surface into a mass of putrefaction, as described above.

Crossland-square, which contains two privies for the accommodation of 23 houses, is exceedingly filthy from drainage and refuse of the same kind as the last; this also contributes very much to the offensive odours in Well Meadow-row.

Armitage's property.

A privy in the lower part of Allen-street, is placed under a dwelling, where the tenant's wife is constantly ill;—others exist under bed rooms in Portmahon, and are equally injurious and objectionable.

Mr. Finningley's property.

Another in a yard about seven yards broad and thirty long, closed in on all sides by houses three stories high preventing the ingress of pure air, drains into a house and cellar, and is so offensive that the tenants never remain long.

Millington's-yard.

Another drains into a house and over the surface of a yard in the same street, to a very considerable extent. Here fever is very common, and the wife and daughter of the tenant, into whose house the drainage escapes, have been afflicted in the usual manner, for some time. The former has been an out-door patient of the Infirmary for eight months.

Mr. South's property.

J. Front, tenant.

Another drains over the surface of a small paved yard in Ellis-street, in which there are only six houses, to the inhabitants of which it is very offensive, and has produced the most fatal results. There have been 14 deaths (11 of them children), and a great deal of illness in this yard, within a very short period. Another in the yard below is in a similar condition, but does not appear to be so injurious to health. Another is also situated under a dwelling in Burnt-tree-lane, where the occupants constantly complain of illness.

Mr. Smith's-yard.

Broomhead's property.

Another privy drains into a house situated in a close yard in Hoyle-street, producing the same symptoms in all who occupy it. The former tenant had the good fortune to leave before the consequences became too serious to allow of his doing so.

Mr. Brown's family.

There have been many cases of fever here, and six children died within the last 12 months.

Hardy's-yard.

There are several instances where these receptacles are placed so near to dwellings, that their exhalations become equally as injurious as their drainage.

Wm. Burgin.

The stench from one situated in a yard in Matthew-street, has produced constant illness in the family most exposed to it during the whole time they have resided there. The tenant himself has been laid up for 16 weeks, and has become so far impoverished and backward with his rent, that he cannot leave. Six of the family who reside in the adjoining house have died from fever, and scarcely a house out of seven, in the whole yard is free from it for a long time together. Fourteen children have died in this yard within the last four years. The yard above is badly situated for a free supply of light and air, and is consequently unhealthy. Another yard at the bottom of this street is so filthy from stagnant drainage and accumulations of night-soil, that it is difficult to approach, while many on the west side of Hoyle-street are so close, and the stench from the open privies and cess-pools so abominable, that the occupants of the houses are "obliged occasionally to go into the street to get a little fresh air." There are several very close yards in the neighbourhood of Daisy-walk, which appear to have an equally injurious effect on the health of the inhabitants.

In Charlotte-square and Forty-row, the houses of which are but two stories, with two low, ill ventilated, and, in many cases, filthy rooms. The privies, intended for the accommodation of 10 families each, are placed so near the houses as to be a nuisance to all who reside in them. Several receive their drainage or evaporation, and the occupiers suffer as usual. Fever prevailed here last autumn to a considerable extent, and several deaths occurred. With the exception of some cases of bad surface drainage, Philadelphia is free from any of those evils which we find attending the badly arranged yards above mentioned. The general aspect of the place being clean. But on pursuing our way back again, down the south bank of the Don, we come into the level district densely populated or occupied by manufacturers, extending down to Ladies' Bridge, and containing all the buildings between Gibraltar-street, Westbar, and the river. Here the streets, which have generally a bad unpaved surface, are very narrow, and often are dirty from refuse constantly thrown into them. This is particularly the case with Mill-lane, Cotton Mill-row, Pear-street, and in several of the lanes in the neighbourhood of Long-croft. Those which have been well paved, such as Water-lane, &c., are with difficulty kept clean from the dirty habits of the inhabitants. The houses in the lowest parts of this district are of the worst possible description, principally inhabited by Irish people and the lowest grade of society. In the neighbourhood of Water-lane and the Isle are many lodging houses, kept by Irish, and which are resorted to by the lowest mendicants and dissolute

Philadelphia, and district immediately south of the Don.

characters of both sexes. Many of these are exceedingly filthy, and are not provided with such accommodation as common decency require. Seven or eight beds are occasionally placed in one room, and no attempt whatever is made to prevent the indiscriminate intermixture of the sexes. The atmosphere in some of these dens is so close and sickening that it is impossible for any one unaccustomed to such places to remain in them for long. All means of ventilation being entirely disregarded. Great improvements have, however, taken place from the constant interference of the police; and we may hope ere long that under the same vigilant system that most of the moral evils which arise from such sources may entirely disappear. The yards, as might be expected in a depraved neighbourhood like the above, are in a most deplorable state. It would, indeed, be almost impossible to give a description of the disgusting scenes. which present themselves in many of those in Water-lane and the Isle. The privies are most abominable, being dilapidated and rendered useless from accumulations of all kinds of filth. In several places the people are compelled to expose themselves for want of accommodation. The yard at the back of the Canine Tavern, in Water-lane, and most of those on that side of the street, are loathsome beyond measure. Many in Castle-green are also choked up with refuse, and almost impassible; whilst those in the Isle are saturated with bad drainage, and in many parts covered with putrid refuse of the most offensive character. In one instance there is a pestiferous heap of about twenty or thirty tons, serving as part of the play ground for the young children. In consequence of the filthy nature of the privies, this heap receives the daily exuvia of a great part of the Isle, so that its salubrious character can be more readily conceived than described. The surface of Mill-lane is generally dirty, the houses being built without any back yard, and the privy placed under a bed-room at the end drains into the cellar of an adjoining house. Here the tenants are constantly suffering from ill health, but "no one stops in them for long." There have been seven cases of fever in the three houses next to the privy. There are also very filthy yards in Bower-street. Court No. 1 contains a privy which drains into a house, affecting the health of the occupiers in the usual manner. Most of the property contained between Spring-street and Water-street is exceedingly old and dilapidated; the surface saturated with drainage and filth of the worst possible description. A great number of pig-sties exist here, and tend very much to in-

Ship-yard and Isle.

Canine Tavern yard. Ship-yard, &c.

Midden in the Isle.

Mr. Chesman's property.

Between Water-street and Spring-street. Mrs. White's property.

Police depot for street sweepings.

crease all such nuisances as these; in fact we invariably find dirty yards connected with pig-sties, and it would be a great boon to the public if more attention to their cleanliness could be insured. A police depot for the reception of street sweepings also exists here, and is highly objectionable from its noxious emanations and its bad drainage. This is said to attract such a number of flies and other insects during the summer, that food or any thing exposed in the houses of the neighbouring inhabitants, is soon black with the filth which adheres to their feet; in other respects the same remarks apply to this as to the depôts in Wicker-lane and Arundel-street.

Mr. Tyas's yard, and yard above.

Smith's property.

Chas. Robinson's property.

Many yards between Spring-street and Love-lane are exceedingly filthy from bad drainage and accumulations of night-soil, and the houses themselves are scarcely tenantable from dilapidation; there are others containing very offensive open privies which drain over the surface and into the houses in Spring-street, of which constant complaints are made by the people who suffer from their effects,—one particularly is situated under a bed-room, and is so pernicious that none of the family has enjoyed good health since they came, and three of another family were afflicted with fever during the last few months. Court No. 1, in Spring-street, is also very close and unhealthy, while the yard adjoining it is covered with filthy drainage from houses, &c.

Court No. 1.

There are two houses in Hick's-lane which receive privy drainage to such an extent that one is considered untenantable, and the other is not much better,—while others in Russell-street and Ebenezer-street are in a similar condition, and exceedingly offensive.

Cooper's yard.

Mr. Bray's yard.

One yard in Westbar-green is in a most disgusting state from exposed night-soil and putrid refuse both of which are constantly emitting the most abominable odours; the houses here are generally empty, as no one will live in them in consequence of the above nuisance. Another yard in Dunfields is unprovided with any surface drains, so that the refuse stagnates upon the surface, saturates the soil, and ultimately finds its way into the cellars of the inhabitants. One case of very malignant fever occurred here; Court No. 2, Dunfields, is also in a very dirty state, and contains the very objectionable arrangement of a privy under a workshop. There is also another in Green-lane containing a privy under a dwelling-house, the tenants of which (man and wife) are both ill. And another, in Westbar-green, in the same position, affecting the health of three of the family as usual. There is one or two instances of these filthy receptacles being placed so near the dwelling-houses in this district, that we were told they " nearly poisoned the inhabitants," but taking them as a whole, they are not so objectionable in this respect as in many other parts of the town.

The course of the river Don in this district, like that of the Sheaf, is again obstructed by weirs, and diverted in its course by goits, so as to form settling ponds for the insoluble parts of the drainage and catchpits for such garbage as may be thrown into them; when this is exposed during the summer, as it is in Millsands dam, and the goit running towards the Isle, it must necessarily emit malaria of a very bad kind. It is true that the bad effects of such exhalations are not felt to such an extent in this district as in the neighbourhood of the ponds, owing probably to the amount of water flowing down the two streams being very different, yet that they do exist is amply proved by the occurrence of two fatal cases of fever in a house over the mouth of the goit at Lady's Bridge, and the prevalence of that disease in the neighbourhood of such places in general; water courses in the centre of a populous district soon become foul from refuse thrown into them, particularly if left periodically dry—such should certainly be covered, as a means of preventing so prevailing a nuisance. The dams above, into which town sewers empty themselves, soon become filled with putrid deposits, and, like the exposed sewers themselves, are centres from which radiate pestilence and death. If, then the dams are allowed to remain, the direction of the main sewers should be altered, all must be carried out of the town, where their contents may be applied with profit.

As this section of our investigation here comes to a conclusion, we may remark, that nothing during the course of our inspection, struck us more forcibly than the conviction which arose in our minds, that dirty habits and dissolute manners were the inevitable products of circumstances, rendering it necessary that persons of very limited means should reside in dirty and miserable localities, in courts and lanes, closely and darkly edged in by buildings placed back to back, and packed together to the utter exclusion of free currents of air. Persons of cleanly and orderly habits, on taking up their residence in such quarters, after vainly struggling to preserve these desirable qualities, gradually yield to the pressure of circumstances and example, and become merged in the mass of filth and depravity which surrounds them. This is certainly no dream, it is a fact.

Nor must we omit again to mention the bad effects observable upon the morals of all, particularly of the young, which are produced by creating the necessity that so many individuals should resort to the same privy, a circumstance so frequently observed during our inspection, and noticed in the preceding pages. If little regard for the general health be felt by the public—if it be found difficult to rouse its attention to the imminent peril of life, which results from the existence of the most abominable and pestiferous nuisances; surely we may trust, for the sake of our common nature, that our appeal, however feeble on behalf of the moral character and habits of the masses, will reach the convictions of some who may have the desire, though perhaps not all the power they could wish, to put a stop to this and all such sources of depravity—to which end, we would suggest the adoption of the following measures, namely,—

Better constructed dwellings, both as regards light and ventilation, and a liberal supply of water; the substitution of water closets for the present open privies, and as many as possible of them in relation to the number of houses; also, more spacious and commodious yards, well paved and drained, with public washing-houses, and baths in populous districts—and above all, places for proper and rational recreation.

REMEDIAL MEASURES.

" In analyzing the above report, it will be found that a very large amount of disease and misery prevails in the densely populated part of the town, wholly attributable to the want of proper sanatory regulations, so much so, indeed, as to leave little doubt that bad drainage, filthy watercourses, open privies, and bad ventilation are the main causes operating to raise the scale of mortality in the borough, to its present high rate. Such being the fact, it now becomes our duty to suggest to your committee such plans as in our opinion are most advisable for the removal of these nuisances, and for the establishment of a proper sanatory code. In the first place, it is of importance that some steps should be taken for the immediate removal of those large accumulations of night-soil and ashes, the exhalations from which pollute the atmosphere and occasion diseases in many parts of the town. But in order to do this effectually, so many difficulties arise, that it is almost impossible to suggest a feasible plan by which this object may be accomplished with advantage. The only use to which these middens can serve, is as tillage for the

Immediate remedial measures.

land. And in this respect their intrinsic value is so much lowered by the repeated drenchings to which they have been subjected, that scarcely anything valuable remains to pay for their removal. It must be borne in mind that the most valuable part of the night-soil is the urine which saturates it, and the most useful part of coal ashes, the soluble potash and lime salts, which always accompany them; hence if these are freely exposed to the rains, as is frequently the case, and the liquids suffered to drain readily away, all these valuable parts are lost, and a useless mass of effete matter, saturated with as much as half its weight of common water, alone remains. It is this large amount of water principally, which prevents the farmers from fetching the night-soil and ashes from the exposed ash pits in the town. They are compelled at present to cart away, at least, one ton of water with every two-horse load of manure, which materially increases the expence. If the water could be got rid of, it is clear that the value of the refuse would be very much increased. It is on this account that we advise, until a more efficient system can be established, that some public body should take the office of collecting the night-soil and ashes in those places where any difficulty arises in otherwise disposing of them. This, as being intimately connected with scavengering, would most probably devolve on the police. They would then have the advantage of being able to form a mixture with their street sweepings, which would soon heat itself dry by putrefaction, and materially increase the value of both. A mixture of equal parts of night-soil and street sweepings would, when dry, have an intrinsic value of from 3s. 6d. to 4s. per ton, and would readily be purchased by the farmer as a manure for turnips and grass.

Value of street sweepings and night-soil.

An extensive farmer, in the neighbourhood of Rotherham, in answer to an application on the subject, states that he gives 2s. 6d. per ton for large quantities of night-soil, and, when good, considers it exceedingly cheap, so that when dry, the price of 5s. per ton would not be too high. Hence, if the expense of leading to the depôt amounted to 1s. 6d. per ton, a profit of at least 6d. per ton on all sold might safely be calculated upon.

Where depôts should be formed.

Depôts for the collection and preparation of materials of this kind should certainly be placed on the outside of the town, at as great a distance from any houses as practicable; for although it is possible to destroy noxious effluvia by chemical means, such means would not be available when the process of putrefaction is absolutely necessary. Some locality in the neighbourhood of the railways would be most advisable as affording the means of transit to a distance. This method of getting rid of the enormous accumulation of filth would not be without its objections; the emptying of privies and cess-pools, by manual labour,—the carting through the streets of a populous district, and the abominable stench left after its removal, are all nuisances injurious to the health of the inhabitants, and ought, if possible, to give place to better regulations.

Effectual remedy.

Under this consideration, we believe the establishment of a complete system of water-closets—in place of the present disgusting privies—with proper sewers, and an abundant supply of water for conveying away their contents, would be the most effectual and permanent remedy for this all-prevailing evil. That such an arrangement is practicable, has been amply proved by Mr. Smith, of Deanston, and several other engineers, who have studied this important subject. And that it would be attended with profit, we shall endeavour to show by the following calculations:—

It is a physiological fact that whatever be the quantity of food consumed by a certain number of adults, in a given time, the whole of the elementary constituents of that food will again be eliminated from the lungs, kidneys, and intestines in the same time; which is amply proved by their not increasing in weight from year to year. Now, the elementary constituents of all kinds of food are derived primarily from the atmosphere, and the soil; those derived from the air are carbon, hydrogen and oxygen—volatile ingredients, which, after being consumed in the process of respiration, are again returned to the atmosphere from the lungs, in a fit state to serve again as food for plants, while the fixed ingredients derived from the soil, the phosphates, sulphates, and chlorides of lime, magnesia, potash, &c., are secreted by the kidneys and intestines, and instead of being returned to this use, are those very ingredients which form the pestiferous accumulations in every yard and corner of the town—which saturate the soil of our courts,—which pollute the air and water, and which, by their putrefactive exhalations, produce disease and death: this is a state of things so contrary to the ordinary laws of nature, that we cannot submit to them long without suffering the usual penalty of neglect. Our soils must necessarily become sterile, unless some means be shortly adopted to restore back to them what we take away; and the only feasible means of doing this is certainly to preserve the refuse of towns. Now it is clear, that if we preserve the whole of the excretions made by a certain number of individuals in a given time, we preserve the whole of the fixed elements contained in the food they have consumed during that time, and by applying them to a soil, might again produce the same amount of corn and potatoes, and of butchers' meat from other vegetables as before. Hence in order to ascertain the intrinsic value of the whole refuse of the town, we have endeavoured to learn as near as possible the amount of food consumed by the whole of the inhabitants, and have taken as our standard the dietary of the Sheffield Union Workhouse, that we might not exceed the truth. From this dietary we find that, 100 paupers, male and female, consume yearly, on an average—

How the value of the refuse may be ascertained.

	lbs.		
Of wheat flour in bread. .	35,930	=	41,062 lbs. of bread.
Oatmeal in porridge..	6,844	=	109,500 pints of porridge.
Rice in puddings. . . .	1,560	=	7,800 lbs. of pudding.
Flour in do.	5,200	=	7,800 lbs. in dumplings.
Peas in soup	975	=	15,600 pints of soup.
Total.	50,509		lbs. of farinaceous food,

equivalent to about ninety-one quarters of wheat. Now as this quantity would grow on about 20 acres of land, the excretions produced from its consumption would, on application to the soil, furnish the whole elements for another 91 quarters in a succeeding crop. With the exception of minor ingredients of no importance, the above quantity of wheat, and excrements resulting from it, contain each the following constituents :—

Potash and soda.	340 lbs.
Lime and magnesia	108 do.
Phosphoric acid	396 do.
Nitrogen	944 do.

The quantity of potatoes consumed by 100 individuals in the same time, admitting that each consumes on an average 4 lbs. per week, when peeled and boiled, equivalent to about 5 lbs. in a raw state, will be 26,000 lbs., or nearly 12 tons; these will contain 19,734 lbs. of water; the remaining 6,266 lbs. of dry bulb contains—

Potash and soda.	193 lbs.
Lime and magnesia	20 do.
Phosphoric acid.	31 do.
Nitrogen	94 do.

Milk, in the proportion of one pint, is contained in the daily rations of the porridge consumed by each individual, and this for 100 during the year, will be 36,500 pints, containing the following constituents:—

Potash and soda	524 lbs.
Lime and magnesia	612 do.
Phosphoric acid	616 do.
Nitrogen	268 do.

In addition to the above, each pauper is allowed 1 lb. of meat per week, or 52,000 lbs. for 100 during the year; this quantity will contain:—

Potash and soda	28 lbs.
Lime and magnesia	4 do.
Phosphoric acid	24 do.
Nitrogen	232 do.

Hence the total amount of these valuable ingredients contained in the food and excretions of 100 paupers per year, will be:—

Potash and soda	1085 lbs.
Lime and magnesia	744 do.
Phosphoric acid	1067 do.
Nitrogen	1530 do.

Now although the articles of food consumed by the inhabitants of the town will differ materially in kind from those consumed by the paupers in the Unions, yet we may safely admit that such of these elementary constituents of their food as are useful to the growth of plants, will differ but little in quantity, and would certainly be rather above than under the above: we may, therefore, safely conclude that the total annual amount of these ingredients contained in the refuse of the 110,000 inhabitants of this town will be the following:—

Potash and soda	1,193,500 lbs.,	or about 537 tons.
Lime and magnesia	818,400 do.	or about 365 do.
Phosphoric acid	1,173,700 do.	or about 524 do.
Nitrogen	1,683,800 do.	or about 751 do.

Value of refuse of towns.

Here, then, is an amount of tillage, now principally lost, capable of supplying the elementary constituents to 63,886 acres of wheat, or of keeping more than 100,000 acres in a constant state of fertility on the four course system of farming.* The money value of such refuse can easily be ascertained by comparing the weight of fertilizing ingredients contained in it, with those found in other manures selling for a certain sum. For instance, if we consider the phosphates to be the most important constituents, as they undoubtedly are in all ordinary manures, we shall find that there is a greater quantity excreted by the inhabitants of Sheffield, in one year, than is contained in 3,140 tons of Peruvian Guano, while the amount of nitrogen and alkaline salts is more than treble the amount contained in that quantity. Hence an estimate of £30,000, being about the cost of 3,000 tons of guano, would be rather under than over the intrinsic annual value of the refuse of this town; and if we consider the phosphoric acid to be the only valuable constituent, and in a similar way compare it with bones, which can furnish nothing else, we shall find that this material alone has an annual value of nearly £10,000, for bones seldom contain as much as one-third of their weight of this acid, so that about 1,660 tons, costing £6 per ton, would be equivalent to that contained in the refuse. Now, as it would be possible, as will be shewn by Mr. Lee, to establish water-closets and a complete system of sewerage, in order to convey all these valuable materials to a proper receptacle on the outside of the town—so would it likewise be possible to precipitate all these phosphates, together with a considerable quantity of the other ingredients, and obtain them in a solid form at a trifling cost. Before describing the process we would beg to call your attention to the chemical changes which take place in many of our rivers which receive the sewerage of large towns. Most of our fresh river waters, particularly those of the Trent, contains considerable quantity of gypsum in solution, and when this comes in contact with the soluble alkaline phosphates contained in sewerage water, it is converted into insoluble phosphate of lime, a material of inestimable value for agricultural purposes: it is on this account that the Humber, which receives a large amount of sewerage from Leeds, York, Huddersfield, Nottingham, and many other large towns, deposits that highly fertilizing mud called "warpe." Now it would be quite easy to imitate this natural process by art,—it would be very simple to make the sewerage water run over beds of gypsum in such a manner, that a sufficient quantity would dissolve to precipitate the whole of the phosphates. Fortunately we shall have (providing the system is carried out), abundance of gypsum at hand in the dry coal ashes which will then have to be carted away, so that by mixing them in a proper proportion with the drainage, and allowing it to enter a pond, in which the precipitated portion might subside, it could be obtained in the form of a thick mud, which might either be dried by artificial heat or by absorption. In order to carry out this plan thoroughly, it would be necessary to have at least three ponds in which precipitation might take place alternately,—one receiving the stream of drainage, while the others are subsiding and being emptied. The bottoms might be constructed in such a manner as to act as filters, so that all the solid contents, with very little water, would be retained.

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* The excretions from the inferior animals are not included in this calculation; but, if they were collected, would of course increase its value and the number of acres. The increase of value from increesing population can be calculated at 2½ per cent. per annum.

Artificial method of precipitating the phosphates.

Distribution of liquid in pipes. See Report of Mr. Smith, of Deanston.

The water of these ponds would still contain the soluble alkaline and ammoniacal salts, and would be of great value for grass and other lands, if conveyed through pipes, &c., to a distance. If the whole constituents, compared with guano, be worth upwards of £30,000, and the phosphates which are separated be worth £10,000, then the liquid portion will be £20,000, and would sell for such sum if properly distributed. The above plan is undoubtedly open to many objections on account of the intolerable nuisance which such a large amount of putrid stagnant accumulations must create. And on this account we have another plan to suggest, which is the same in principle, so far as the precipitating ponds are concerned, but which is superior to it in all other respects. It is, to use caustic magnesian lime as a precipitant instead of gypsum; this will have the effect not only of precipitating all the phosphates, but a portion of the ammonia, in the state of ammonia magnesian phosphate; and what is more important still, if added in slight excess, it would have the effect of retarding putrefaction, and preventing the escape of noxious malaria. This then would be the best plan of getting rid of those pest holes of filth which now pollute the town; and the cheapest method of restoring back to the farmer, that which we take from his soil, and thereby enabling him to maintain and increase its fertility.

Improved plan of precipitation.

Removal of coal-ashes.

If such a plan as the above should ever be adopted, it will be necessary to provide some means for removing the coal-ashes and other materials constantly produced in a town, and this, we believe, can only be effected profitably by the establishment of dust-bins, provided with such grates as will only allow the pure ash to pass through, and of such a construction as to exclude the rain. The large amount of cinders contained in ashes at present, is not only one of the principal objections to their use by the farmer, but a source of considerable loss to those who produce them. Many specimens which we have examined, contain as much as 80 per cent. of combustible matter, which renders them unavailable for any practical purpose, unless it was for burning over again. Such, indeed, is the amount of waste here, that a considerable profit would be realised in any town, where coal is more expensive, by their sale. When deprived of nearly all the cinders by sifting, these ashes would contain a considerable quantity of silicate and sulphate of lime, with a small quantity of silicate of potash and sulphate of magnesia. On this account they form a valuable top dressing for wheat, grass, and other white crops, and where soluble silicate is required, there would certainly be no difficulty in disposing of them, when dry, and free from cinders, at a remunerating price, or of using them as an absorbent for the mud of the precipitating ponds, as described before. In the neighbourhood of London, and other parts, these ashes are extensively used in the process of making bricks, and are the only materials from which any profit is made by the town. When mixed in small quantities with common clay, they undergo, when heated, a kind of semifusion, which converts the whole into a kind of porcelain, by filling up all the pores with a fuzible glass. A brick made in this way bears the same relation to one made in the ordinary manner, that porcelain does to common earthenware. It is not absorbent, consequently less liable to destruction, and is admirably adapted for moist situations, such as sewers, waterworks, &c. Certainly, they might be made available for this important purpose here.

Sites of old privies must be limed, filled with earth, and pitched.

Another consideration is also necessary in carrying out this important undertaking, and that is the the preparation of the ground after these privies are removed. The whole neighbourhood is so thoroughly saturated with this bad drainage, that it would be some years before the filthy exhalations would cease. On this account it would be advisable to employ a small quantity of lime in each case, and then to fill up the place with clay, and pave it over with good pitching-stones, in the usual manner.

Supply of water.

It is clear, however, that this great measure could never be accomplished without the combination of another not less extensive one—namely, a constant supply of abundance of water; and as this is a subject, which, independent of any other consideration, has been strongly urged by Her Majesty's Commissioners, who were appointed to report on the sanatory state of large towns, it would be superfluous in us to make any lengthy remarks. The importance of an ample supply of good water, however, at a price within the reach of the humbler classes, is a subject worthy of the greatest consideration, for we fear that a considerable amount of the filth which the houses and courts of many of the humbler classes constantly exhibit, together with the disease and misery which so frequently attend it, is wholly attributable to a deficient supply of this great necessary of life.

Quality of water.

The water supplied by the Company is obtained from the hills of millstone grit, in the high moors, about six miles west of the town. It is there gathered into an extensive reservoir at the Redmires, from which it descends in a rapid stream to dams in the neighbourhood of Crookes. The water in the Redmires reservoir is somewhat coloured by the peaty matter from which it flows; but this is nearly all converted into carbonic acid and water, by oxidization in its rapid descent along the open feeder above named. So that by the time it reaches the dams, from which the town is supplied, it is nearly colourless. The water itself is of the purest quality, containing only seven and two-tenth grains of foreign ingredients in the imperial gallon, not more than three-tenths of a grain of which could be separated by the filter. The following minute analysis of the water from the Redmires will shew the character of its solid contents:—

	Organic matter from peat	1 60	
Suspended separable by the filter.	Per oxide of iron	0 10	
	Alumina	0 12	
	Silica	0 10	
	Sulphate of lime	1 91	
	Do. of magnesia	0 12	
	Do. of potash	0 16	
	Chloride of sodium	0 55	
	Do. of potasium	0 30	
	Soluble silica	0 23	
	Bicarbonate of magnesia ..	1 28	
	Free carbonic acid gas....	0 49	Cubic inch.
	Less...........	0 24	

Total foreign ingredients per gallon .... 7 20 grains.

From the above it will be perceived that the amount of sulphate of lime and magnesia is less than two grains per gallon, and as these are the ingredient which give water the property of hardness, their deficiency is of the greatest importance. The composition of the waters obtained from Agden Brook, the Strines Brook, Ewden Brook, Little Don, and others, draining from the millstone grit, is very similar in composition to the above, and all admirably adapted for culinary, dietary, and general domestic purposes. From the small quantity of sulphates which these waters contain, they are prevented from acting upon and corroding lead, and are therefore not liable to become impregnated with that pernicious metal, by keeping in its cisterns or flowing through its pipes.

Quality of water deteriorated by intermitted supply.

The quality of this and all other waters is materially injured by stagnating in iron pipes, or what is still worse, by flowing through such as are alternately filled with water and air; in this case a thin film of oxide of iron is formed every time the air enters the pipes, and is partly removed by the strong current when the water is turned on. Hence the supply becomes strongly impregnated with this material, rendering it injurious in many operations. In the washing of clothes, for instance, the affinity which exists between oxide of iron and ligneous fibre, causes them to combine together, and to produce a yellow colour, which no expenditure of soap or labour can obliterate. The intermittent supply of water in this town is fraught with the above evils to a considerable extent. I have found as much as two grains of suspended oxide of iron in an imperial gallon of branch waters at the lower end of the town, which rendered it quite unfit for use. The supply of water in many parts of the town is not kept up for more than two hours at a time, twice or three times a week, and this being distributed to the humbler classes by means of public stand pipes, many find great difficulty in procuring a sufficient quantity for ordinary domestic purposes, much less for scouring their houses and courts when required. Hence this practice, instead of being sanatory in its effect, becomes a source of filth and disease to the inhabitants. Many are in the habit of storing the water in wooden tubs placed before their doors; and here again, it soon becomes so foul from putrefaction, or so filthy from the deposit of soot, as to be unfit for use. In fact, there appears to be no feasible plan of insuring proper sanatory regulations without a constant and abundant supply; but as this is purely an engineering question, we shall leave it for Mr. Lee to shew that such a supply is at hand, and describe in detail the important advantages to be derived from it.

How supplied to the Poor.

Well water.

The well waters of the town is of a very different character to that supplied by the Water Company, being intensely hard, from the presence of sulphates, and often impregnated with bad drainings, from the causes already assigned; although in the western district they are free from the putrid drainage, yet they contain between 30 and 40 grains of sulphate of lime and magnesia per gallon, which renders them so hard as to be unfit for use with soap. In the direction of Attercliffe, and in the neighbourhood of the Park, the well waters occasionally contain as much as two drams of sulphate of magnesia per gallon, which renders them, for washing, useless, in a similar manner; while those in the direction of the Don are much purer and might be used for all ordinary purposes. No general rule however can be laid down as to where pure or impure waters exist, as so much depends on the depth of the well, the position of the strata, and its vicinity to bad drainage. We may safely consider that all waters which have filtered through the surface of the earth — particularly such as the town of Sheffield is built upon — cannot be quite so salubrious as those obtained from the insoluble millstone grit rocks of the high moors; in fact the amount of well water now used for domestic purposes, compared to that supplied by the Water Company is very small, and when a more abundant supply is given by them, it will probably diminish to nothing. Some idea may be formed of the inestimable value of a supply of pure water to a town, when we consider the amount of soap which would be required for washing in water containing 30 grains of gypsum per gallon; for if five gallons only were used to wash the clothes of each individual per week, 646 grains of dry soap would be entirely decomposed by this quality before any lather could be obtained, and the cost of this to the whole town would annually amount to upwards of £2,000.

VENTILATION.

Heating and ventilating of private buildings.

Of all the sanatory improvements capable of ameliorating the condition of the poorer classes, ventilation, perhaps, may be considered the most important; pure air is quite as essential for supporting the respiratory process, as wholesome food is requisite for the digestive one; without a due supply of both, animal life must soon cease to exist. When we reflect that the atmosphere contains only one-fifth of its volume of the life-sustaining principle, and that the whole of this principle is taken away from 125 cubic feet of air by the respiration of one man, during the 24 hours, and that he converts it into a 125 cubic feet of gaseous poison, capable of producing death, even when largely diluted with pure air, we have little difficulty either in understanding why so large an amount of suffering and death was formerly produced in crowded hospitals, gaols, and ships, where the principles of ventilation were unknown; as, in coming to the conclusion that similar effects must be produced on the occupants of houses in our close courts and alleys, and on the artizans in crowded workshops, where these principles are entirely disregarded. Any person who has visited such places, and seen the amount of mischief consequent on bad ventilation, would at once be convinced of the necessity of adopting some decisive and immediate steps for its mitigation or removal. When we further consider the situation in which these houses are placed, surrounded by privies, middens, and filthy drainage, it is obvious that any means of ventilation which have hitherto been devised, such as apertures in doors, windows, &c., would only tend to admit an atmosphere loaded with putrefactive and pestilential emanations, and hence increase the evil instead of subduing it. On this account, in numerous localities of the town, it is found that doors and windows are kept constantly closed for the purpose of excluding, as much as possible, the bad odours communicated to the pent up air by stagnant drains and filthy accumulations. In such localities the atmosphere at the tops of the houses is comparatively pure, but any attempt to obtain it thence would involve such an alteration in the structural arrangement that it could not be applied to the mass of old buildings which most require it. The improvement of the air therefore in existing dwellings, arranged as they are, with an utter disregard to the passage of pure atmospheric currents, demands as a requisite preliminary the complete and speedy removal of all decomposing animal and vegetable matters, the abolition of open privies, and a general and immediate supply of water; but it must be borne in mind, that the benefit arising from the first, can only be secured and rendered permanent by a complete system of sewerage; that from the second, by the general adoption of water closets; and that from the last, by making the supply constant and abundant; when these have been done measures may then be taken to insure the regular renewal of wholesome air in sleeping and other apartments. It is a principle in pneumatics that warm air is specifically lighter than air at a lower temperature, consequently it rises through the latter as a cork would rise through water; the air respired from the lungs, together with that in contact with the body, is heated considerably and rises with greater velocity, so that nature herself has provided for the rapid removal of the poisoned atmosphere, which man is constantly producing, often however her laws are thwarted, either by obstructing currents of light air in their ascent, or by preventing the admission of fresh air to supply their place; in a close bed-room, for instance, where there is no fire, there would be a constant circulation of air from the sleeping inmates to the top of the room, thence down the walls, to be used over and over again until it becomes totally unfit for respiration. If apertures were made in the wall just under the ceiling, the heated and polluted air would escape, and fresh and pure air would come through under the door to supply its place; if, as is generally the case in the habitations of most of the Sheffield artizans, the sleeping-rooms are over the sitting and other rooms, the air passing through the latter in its ascent, would become heated by contact with the warm walls and furniture before it found its way into the rooms above. Thus an agreeable temperature would be maintained during the cold winter months, or, as an improvement to this simple method of heating, a cast-iron tube might be placed at the back part of the fire-place, extending up the chimney as far as the level of the bed-room floor, it might then pass into the room; the lower end, where practicable, should open into the external atmosphere, but where impracticable, as where the houses are built back to back, it should open into the sitting-room itself; this tube would be heated by the hot air passing up the chimney, so that a constant current of pure air would be established through it, and heated in its course; the bed-room would, by this means, be rendered comfortable for the reception of a family, and with the addition of the openings under the ceilings, perfect ventilation would be insured. When the lower end of the tubes communicate with the external atmosphere are open, and the ventilators under the ceiling of the chambers and the house door are closed, the warm air supplied by the tube to the room above would be drawn down stairs to supply the loss of that which is constantly carried away by the current up the chimney. Thus, instead of being exposed to cold draughts, the inmates would enjoy the comfort of a free circulation of warm and pure air. This method would, of course, be useless in the heat of summer, where fires are constantly kept for cooking purposes; in which case open doors and windows will answer the purpose of ventilation generally. The simple plan of throwing bed-room windows open, particularly where no other method of ventilation is practicable cannot be too much extolled; if any method could be devised for insuring this being done, there can be no doubt that great improvement in the general health would be effected. The great obstacle appears to be the deposition of smuts from the smoke, which soon defiles everything (but of this elsewhere). In consequence of coals being cheap in this district, fires are kept by most of the inhabitants during the whole year; this is certainly the most effective method of insuring perfect ventilation in sitting-rooms, as from one to two hundred cubic feet of air will pass up the chimney, and consequently through the room each minute, a quantity sufficient to supply any ordinary family with the amount required. It would be no difficult matter, where the houses are built back to back, to warm the air admitted to them, and effect ventilation in both sitting and sleeping rooms, by means of a wide flue running on a level with the ground floors, and in contact with the back part of the fire places, (which should, in this case, be made of cast iron), grated apertures through the sides of these flues into the rooms, would admit a constant supply of fresh air, warmed by its passage over the heated surface above-named; this, in the night time, would rise into the bedrooms above, rendering them warm and comfortable. If fires were not required it would be very easy, at a cheap rate, to heat the whole air required by cottages; but as these fires are indispensible for cooking operations it is useless proposing any plan.

Ventilation of Workshops.

The ventilation of workshops is a subject to which, on our inspection, we paid particular attention; the want of which, in many towns, is a source of more injury and mischief to the health of the workmen than even their badly ventilated houses. In Sheffield, however, there are few trades, with the exception of file-cutting, which require any considerable number of people to work together in one room. In the various departments of forging and grinding, of steel casting and converting, there is always abundance of air, and means are taken to insure its regular renewal. More than usual attention appears to have been paid by the manufacturers to increase the comfort of their workmen in this respect, and there are certainly few instances where any complaints on this subject could be substantiated. In file-cutting, however, we find from 12 to 20 men crowded together in one small room, where the most scrupulous care is taken to exclude every particle of air, by plastering up broken panes of glass with paper, or any small crevice through which a trifle of the regenerating fluid might pass. The atmosphere of many of these places is so close, that we found difficulty in remaining in them even for a short time. The rooms in which these men work are generally long galleries about four yards wide and three high, liberally supplied with light by windows all along one side. The seats on which they sit to work are placed about three feet from each other, so that each man is just allowed the use of his arms for labour. There is, during the colder months, a fire in the room, which, however, burns so tardily for want of air, that a very imperfect ventilation is effected by it; during the cooler parts of the summer months, when the windows are closed and no fire is made, a due supply of air is absolutely impossible, and were it not for the small quantity which finds its way through crevices and by diffusion, these men would die before they had been in the place for two hours. There is one instance where we found not more than 135 cubic feet of air per man. Now this amount, unless a current was constantly maintained by efficient ventilation, would in a short time become so highly carbonised, as to be greatly injurious to health. It cannot be surprising that men working in such polluted atmospheres should complain very much of lassitude and fatigue, that they should have recourse to the beershop for stimulants, and that they should be deficient in the mental and bodily development, and in the exhibition of the kindlier feelings which characterise so many of the Sheffield artizans, engaged in other and more genial employments. Some uniform and certain method of ventilating their workshops in summer, and of warming such air for ventilation in the winter, should be put in practice without delay. There can be no doubt, however adverse these men are to alterations and improvement, they would never be so blind to their own interest and comfort as to oppose such important sanatory measures; although, we believe, in one instance, such has really been the case. In any place where a steam boiler is at hand, pipes incased in a hollow flue, on a level with the shop floor, both ends of which should communicate with the external atmosphere, might be kept constantly full of hot water or steam, so as to warm the air in contact with them; valved apertures should be made through the top or sides of the flue, so that the heated air might rise into the shop. One of the dome-shaped ventilators, fixed in the ceiling of the workshop, or, if possible, a flue leading into a chimney where a fire is constantly kept, would be sufficient for the removal of the vitiated air. This would be a far less expensive and much more effectual method of heating these places than the one now adopted, and would have the great advantage of securing a plentiful supply of air, and of relieving these men from that peculiar and unhealthy looking perspiration which most of them have after remaining in the room for a few hours. In summer, the room would be self-ventilating; the heated air would escape from the dome at the top, and fresh and cool air would pass through the flue over the pipes (which in this case would not contain hot water) and through the apertures as above. This plan of ventilation would also apply to rooms in which the fitters-up of spring-knife cutlery are engaged,

Johnson, Cammell, & Co.

and which are generally close; causing the men to complain very much of weariness and lassitude towards night. In most instances, attempts have been made in these shops to effect better ventilation by means of fans, placed in one of the upper squares of a window; but from the strong draughts which are occasionally produced by them, and complained of by those who chance to be in the way, they are generally stopped up by the workmen. In some instances, holes have been made through the tops of the doors, with a similar object, which have been subsequently stopped for a similar reason. In fact, it is clear that no method of ventilation will be suffered by these people, unless it be an uniform and insensible current, warmed to the proper temperature, such as that resulting from the simple arrangements just described.

Injurious tendency of dry grinding.

Of all the processes carried on by the manufacturers of Sheffield, there are none so injurious to health, and none that require more efficient plans for carrying off noxious particles, than that of dry grinding. In this process, a large amount of metallic particles, and minutely divided grit-stone, is constantly escaping directly under the nostrils of the workmen; is scattered and diffused through the whole atmosphere of the place, and consequently inhaled by those producing the dust, as well as by those occupied in the same room, at other branches of the business; thus eventually clogging the air-passages of the lungs, and causing the fatal disease known by the name of "grinders' asthma." The deaths occasioned by this disease, formerly very numerous—being nearly 50 per cent. amongst those under forty years of age, and carrying off all before the age of fifty—are much reduced by the introduction and use of the ventilating fan. This fan is placed in a round box, and is turned by means of the same drum which causes the grindstone to revolve, and a strong current of air is thus produced, drawing the particles of steel and grit-stone from its face, and conveying them away, either to the top of the building; through its sides; or into a vessel of water below. In order to insure as good a draught as possible, it is necessary that the air pipes leading from the stone should be inserted into the centre of the drum, opposite to the axis of the fan; for, in this case, the momentum produced by each vane is effective through its whole extent; while, if the flue enter near to its circumference, a great loss of draught will be the consequence. Fans, constructed on the proper principles, are in operation at the Suffolk Wheel, and effect such an amount of exhaustion by their rapid revolution, as to produce a pressure of four ounces in the square inch—an amount which is not attained by any other we have seen. The cost of such fans, with all their bands and air-pipes, is from £1 to 30s., so that any grinder, with a little economy, might procure one, and we are glad to find that a feeling prevails amongst the workmen to avail themselves of this improvement. In many places, the owners, much to their honour, have adopted a complete system of ventilation by fans, for all dry grinding operations, but in consequence of not being duly appreciated, and in some instances wilful damage having been done, their example has not been generally followed. The use of the fan should be compulsory; for the mischief it is intended to remedy is not confined to the individual dry grinder, but affects others working in the same room, who do not contribute to its cause. We should also earnestly recommend the use of fans, for carrying off the fine particles of dust produced in glazing cutlery, in buffing Britannia metal, and in other operations where injurious particles are generated; such a slight draught might be produced as not to carry away the sand and other materials used in the process, but which still would be sufficient to carry off that which would otherwise escape into the room, and prove offensive to those employed.

Fans should also be used for glazing and buffing.

The processes of bone cutting and button spinning are operations in which large quantities of dust are produced, but what is remarkable enough, is not considered injurious when taken into the lungs, simply because it "does not disagree with the stomach." We were told by the workmen that "it must be good for their health because it contained so much jelly;" but we found few who did not suffer, more or less, from constantly inhaling it. This dust might readily be carried away by the use of the fan, and deposited in a receptacle on the outside of the room, and thus a more comfortable, if not more healthy, atmosphere maintained within. Fans are not only useful in removing solid particles of matters floating in the atmosphere, but are powerful ventilators to the room in which they are placed; the strong currents of air which are drawn through them, sometimes amounting to two or three hundred cubic feet per minute, requires the admission of the same amount of fresh air from the exterior to supply its place: hence there can be little doubt that great protection to the health of the workmen would be effected on this account alone; and we further believe that, where power is at hand, this method of ventilation might be safely and advan-

Also for bone cutting.

They act as ventilators.

tageously applied to all work-rooms and manufactories; in which a constant supply of fresh and pure air is so necessary to the well being of the inmates.

Effects of Gas.

We must not omit to notice that all the evils resulting from bad-ventilated workshops are very much aggravated by the combustion of gas, for when we bear in mind that every cubic foot consumed requires from 10 to 14 cubic feet of air to form those poisonous compounds which are dependent on its perfect combustion, we shall have little difficulty in understanding what would be the effect of 10 or 12 argand burners, each consuming 4 or 5 cubic feet per hour, on the atmosphere of a close room like many of our workshops; such burners would each hour consume the whole of the oxygen contained in 160 cubic feet of air, and produce compounds which would render five times that amount incapable of supporting life; hence such an amount of contamination is an additional reason for adopting an efficient method of ventilation; this, fortunately, may be effected by collecting the heated air proceeding from each gas flame into a large inverted funnel, terminated in a tube 1½ or 2 inches in diameter, leading into a chimney, or, where this is not at hand, into a flue or iron pipe rising vertically to a considerable height; the strong current of heated air would thus escape, and fresh cold air would enter by the door and windows to supply its place; this plan is applicable to a room where only one light is kept, as well as to those where there are many, and would be found of great service to all who have hitherto suffered from breathing such polluted atmospheres.

Heating and ventilation of public buildings.

The ventilation of public buildings, particularly such as are destined to contain large assemblages of people, is a subject which demands the greatest attention; but which, in this town especially, has either been utterly neglected, or attempted without the least knowledge of those principles of science which alone could ensure success. The defects which prevail in almost every building we have examined, where any kind of systematic ventilation has been attempted, appear to have arisen from a mistaken idea that vitiated air would leave a room without fresh air entering from the exterior to supply its place; or that fresh air could enter without the vitiated air having the means of escape. In one of the largest public buildings of the town, where large sums of money have been expended in heating by hot water, we find the latter error particularly exemplified. Means are provided for admitting the heated air into every room of the building, but the necessary provision for its escape has been altogether forgotten;

Wesley College.

the consequence is that the plan is quite ineffectual and can only be rendered partly available by opening the windows, and this only when the wind is still. This, we believe, is the only case in the town where the proper system for bringing air *from the exterior*, and warming it by passing over hot water pipes has been adopted. There are several other buildings containing the very objectionable arrangement of a series of hot water pipes in small flues under the floor, which flues are covered with a light grating, through which we were told the heated air would ascend; but had the projectors well considered the matter, they would have found the air must first get into the flue before such could ascend from it, and would then have provided more effectual means for its doing so; by such an arrangement a double current is established through the grating,—one downwards from the room to the tube, another upwards from the tube to the room,—so that the same vitiated air is used over and over again for respiration and becomes highly offensive. If the ends of the air flues in which the pipes are placed were open to the external atmosphere, and a proper arrangement made for the escape of the vitiated air, then this plan would become perfect in every respect, as good ventilation would be insured.

Church Collegiate School.

Ecclesall Workhouse.

A great number of public buildings are heated by the common cockle stove, and have no other means of ventilation than what open windows and doors can afford; from the high temperature which the metallic surface of the stove occasionally acquires, the air is so completely baked as to become injurious to health; in fact there appears to be no method of heating air so simple in its arrangement, so economical in point of cost, and so salutary in its effects, as the one by means of pipes, filled with hot water or steam. These to be effectual should be of the triangular form proposed by J. Sylvester, Esq., so that the greatest possible surface may be exposed to the air; and the dust which is the principal cause of offensive smells, be prevented from lodging upon them; when such are properly placed in wide horizontal flues, and a current of hot water is constantly maintained through them, the heated air which they produce may be conveyed into any number of apartments, providing proper means be adopted for its escape. Perhaps there are no public buildings in which there is more necessity for systematic ventilation than schools, for in these a large number of pupils are daily crowded together, and tend to contaminate the atmosphere with great rapidity. In this town there are few in which any means of ventilation are adopted, with the

Tube proposed by J. Sylvester.

Ventilation of Schools.

exception of what takes place spontaneously from open windows, apertures in the sides of the buildings, and domes at the top; all methods, more or less imperfect, being dependent on the direction of the wind, the presence of fires, and other agencies over which there is no control. That such arrangements are objectionable in crowded rooms we had ample means of ascertaining from the constant alterations which some of the buildings undergo; generally speaking, however, the school rooms were so lofty that no inconvenience was felt by either master or pupil. Most of the large schools have small class-rooms attached, which on account of their being badly ventilated, and receiving what air they do get from the large room itself, becomes exceedingly close when crowded with pupils, as they often are, to suffocation. In one, which did not contain more than 1,000 cubic feet of air, we found 30 young children, many of whom were evidently suffering from bad air; such a state of things cannot be otherwise than injurious to health, and well calculated to lay the foundation of those pulmonary diseases to which the young frame is so subject.

St. James's School.

In buildings recently erected at the public expense, destined to contain the aged, the afflicted, and such as are incapable of withstanding the baneful effects of cold draughts, or a vitiated atmosphere, like the hale and strong, we certainly expected to find some plan of ventilation in accordance with the present state of science, but instead of this, the sleeping and other rooms in our Sheffield Union Workhouse are totally unprovided with any such plan. It is true that the windows are opened during the day, and the rooms freely supplied with air when *no one is in them*, but this must soon become contaminated in the night, and highly injurious to the inmates: the small fans placed in the windows, together with the apertures over the doors, leading into the close passage, can have very little effect on the air of a crowded bedroom; a regular arrangement of flues for conveying away the products of respiration, as well as for bringing an uniform warm current to replace it, is absolutely required in all such places as these. A variety of attempts have been made to warm and ventilate the Infirmary part of this Workhouse, by placing hot water pipes at the top of the room (instead of the bottom), and making apertures through the walls under the ceiling,—these apertures would have the effect of letting out all the warm air produced by the pipes, as none could possibly descend in consequence of its superior levity. Fires are fortunately placed in many of the rooms in this depart-

Sheffield Workhouse.

ment, and are very much superior, in promoting ventilation, to any of these futile attempts. There is one subject connected with the ventilation and sanatory state of this Workhouse which deserves special remark, it is the existence of a stagnant watercourse which receives the drainage from a portion of the town above, and flowing directly under the building, is often obstructed to such an extent, by accumulations from the water closets, that it drains into the cellars, and is very offensive. To prevent such drainage the water is daily pumped out, and is used for washing the yards and other ordinary purposes: the exposure of such a large surface of filthy water to evaporation must be decidedly bad; but this is not all, a large open grate is placed over the stagnant drain, through which all the gaseous results of putrefaction can pass, so that the air conveyed into the wards in its neighbourhood becomes highly pernicious to health. We were not at all surprised to hear from the Governor, that at least two-thirds of the disorders which prevailed in the Workhouse originated within the influence of this place. It should certainly be covered over, and proper means be taken to insure a constant stream of water through the goit.

Bad stagnant draining at the Workhouse.

Ecclesall Workhouse.

On visiting the Ecclesall Workhouse, we did not find the arrangement for ventilation of a much better kind than those just noticed at the Sheffield. Apertures, however, have been made through the bed-room ceilings, and flues constructed from them to the outside of the building, for the purpose, we are told, "of bringing in air," and in order to prevent the current from "rushing downwards" so rapidly, an iron disc is placed over these apertures to diffuse it. It must, however, be evident from the principles laid down, that unless a strong current of air was always blowing against the mouth of the flues on the outside, their action would be quite the reverse, the air heated by the sleeping inmates would rise and pass out of these apertures, while fresh air would find its way under the bottom of the door, or through any opening where it could find such an entrance to supply its place. Other parts of the building are heated by means of hot water pipes, in such a manner that the same air is warmed over and over again as stated before; in other respects the general arrangement of the building appears to be good.

The Infirmary.

The Infirmary is certainly an establishment in which good ventilation is more particularly required than in any other public building we have visited; but, notwithstanding its lofty rooms and wide airy passages, a degree of closeness is always perceived by a stranger on entering it,—and as fresh air heated to a proper temperature is undoubtedly one of the most essential agents in promoting the recovery of the sick, so likewise is stagnant and bad air very much calculated to increase the severity of disease; the inefficacy of open windows and doors, and of apertures through the wall, for insuring the constant renewal of air, in rooms crowded with sick persons, without at the same time subjecting them to chilling draughts, which in many instances would be attended with fatal results, is too palpable to require any remark, while the draught up the chimney of a common fire is perfectly inadequate to draw into the room a sufficient supply of air for 20 or 30 people, even if proper means were taken to distribute it. As these appear to be the only means at present in existence, some steps should certainly be taken to apply a more rational and salutary arrangement. In the fever ward which has recently been constructed we were somewhat puzzled with the number of trap-doors and little air cupboards which every room presented, and at the first sight were led to believe we had at last hit upon a systematic plan; but after a lengthened investigation, we were compelled to relinquish the hope of ever being able to understand it. One of the principal features in the arrangement appears to be a large vertical shaft, having an opening at the bottom very conveniently situated for the entrance of the salubrious exhalations from a privy close by; from this shaft flues appear to deviate and to open by little doors into the top and bottom of each room; there is no heating apparatus in connexion with this air chamber, so that whether it is intended to let air in, to take it out, or to perform both these processes at once, we were unable to divine; in addition to the above there are also apertures through the walls at the top and bottom of each room (sometimes on both sides) in communication with the external atmosphere, these probably are intended to supply the place of cold effusions; as when all are in operation during the winter months they would certainly do this to perfection. By such an arrangement *ventilation* would be *insured,* but warmth and comfort would be sacrificed. In wards set apart for the treatment of infectious diseases, means should be adopted for destroying all noxious emanations, by conveying the contaminated air through a fire or over some of those chemical compounds which are known to destroy its pernicious effects. Such plans could readily be applied in all cases where systematic ventilation was adopted, and would certainly be the means of preventing the extension of those malignant disorders with which fever wards are so often tenanted.

Smoke nuisance.

In reporting on the subject of ventilation we must not omit to direct your attention to the evils attending the non-consumption of smoke, for the immense volumes which are daily poured out from our steam engine and other chimneys tend to contaminate the atmosphere, the changes of which distribute the smuts for miles; and moreover a pecuniary loss is sustained by the town of many thousands of pounds per annum. We are aware that a strong feeling prevails amongst the manufacturers, most of whom are opposed to any interference on this subject, and should on that account be sorry to advance anything which could be offensive, but in making a report on the causes affecting the health and habits of the inhabitants, we should not be doing our duty, were we not to expose every process which affects them. We remarked, on a former occasion, that the particles of soot floating about in the atmosphere were so numerous that people were prevented from having recourse to the most common method of ventilation by opening windows and doors; in many places the evil is so extensive that the inhabitants find the greatest difficulty in maintaining personal or domestic cleanliness. After great labour in washing clothes and other articles, they are in many instances "completely covered with blacks" before they become dry; and require the process to be repeated. Many of the humbler classes, who have been accustomed to more cleanly localities, on coming to reside at such places as these, are so repeatedly foiled in their attempts to appear tidy as before, that they at length lose all care for further exertions and sink down in abandoned filth and wretchedness. On this account, the smoke nuisance becomes an evil of no ordinary kind, and should be visited with all the odium it deserves; many have informed us that at least one-third more expenditure of soap and labour is required to wash the clothes of people resident in Sheffield than of those who reside in the country, and this is a statement which we believe not to exceed the truth; so that if each individual in the town now consumes two ounces of soap per week only, and it could be reduced by one third of an ounce, by securing a clearer atmosphere, a saving of £7,600 would be effected in this article alone. The saving of labour would of course be much greater, for if we consider the low average of 6d. per week to be paid by each inhabitant for washing, and that it could be reduced to 4d., then the annual saving would amount to the enormous sum of £560,630. The saving in money, however, is a mere trifle, compared with the benefits which would arise in other respects; for the establishment of habitual cleanliness amongst the humbler classes must certainly be looked upon as one of the most important steps towards ameliorating their condition.

The few unsuccessful attempts which have been made to prevent the formation of smoke in this town, should not be considered so conclusive as to cause the whole inhabitants to consider all plans fruitless and condemn them accordingly; for with the practical evidence of Sir H. de la Belthe and Dr. Lyon Playfair, and the opinion of every scientific man who has investigated the matter, before them, such a judgment would not be worthy of a town standing so high in its manufacturing and mercantile relations as Sheffield We are fully aware that coals are used for several operations in the Sheffield trade, such as steel converting, forging, &c., as well as for steam engines, and there may be some few instances in which smoke is unavoidably produced; but from our inspection of the manufactories we are convinced that extensive mischief arises solely from the steam-engine fires themselves, and not from the processes above-named. The furnaces used in steel converting, as well as those for heating iron bars for the forge, are, during their operations, raised to a high temperature, and open in such a manner, that perfect combustion is insured by abundance of air. It is only during the time they are being supplied with fuel and the careless manner in which it is thrown in, that any quantity of smoke is produced, and this assuredly might be prevented by a little better management. It is a well known fact that when fresh coal is thrown on the surface of red hot cinders, it immediately resolves itself into the same volatile compounds that it would do if heated on a close iron retort. Light carburetted hydrogen, olifient gas, and the vapours of tar are abundantly produced, if atmospheric air is present in sufficient quantity to unite with the whole of the carbon and hydrogen of these compounds, perfect combustion is insured, and they are entirely converted into carbonic acid gas, and the vapour of water, invisible compounds which escape; but if atmospheric air is deficient, then its oxygen combines with the element for which it has the greatest affinity, namely, the hydrogen; and smoke is produced by the carbon which is set free. It must be evident, therefore, that considerable loss of heat is sustained in all operations where the supply of air and fuel is not so regulated as to insure both combustible elements being burnt. Experiments, in fact, have shewn that this loss often amounts to as much as 20 per cent on the value of the coal, which alone should be an inducement to the manufacturers to adopt some means to prevent such a waste. In many instances the smoke may be entirely consumed, or very much lessened, by the judicious application of the fuel; if, instead of throwing it on in such large quantities at a time, as is frequently the case at present, small portions were used oftener, the gas produced would, in the case of an open furnace, be entirely consumed and no smoke produced; but if the air has no access to these gases, as is frequently the case in close steam-engine fires, they would escape unburnt, the tar and olifient gas being previously decomposed (in passing over the red hot cinders) into black smoke, &c., which escapes up the chimney. It is therefore evident that a supply of fresh air to the upper surface of a steam-engine fire, with judicious management in the application of the fuel, is all that is required to prevent the formation of smoke; and as this air could be readily brought in by means of apertures in the sides, or other contrivances which suggest themselves, there is not the least necessity for the sufferance of this intolerable nuisance any longer.

REPORT

BY WILLIAM LEE,

ON THE PHYSICAL GEOGRAPHY AND GEOLOGY OF THE BOROUGH OF SHEFFIELD;—AND ON THE WATER SUPPLY;—DRAINAGE;—STATE OF THE PAVEMENTS OF STREETS, COURTS, &c.;—ON THE CLEANSING OF THE STREETS AND COURTS;—ON THE APPLICATION OF TOWN REFUSE TO AGRICULTURAL PURPOSES;—ON NEW THOROUGHFARES, WIDTH OF STREETS, &c.;—ON THE STRUCTURAL ARRANGEMENTS AND VENTILATION OF HOUSES;—ON THE STRUCTURE AND VENTILATION OF WORKSHOPS;—ON THE OBSTRUCTION OF RIVERS BY GOITS, WEIRS, &c.;—AND ON NUISANCES PRODUCING SIMILAR EFFECTS;—ON THE SHEFFIELD UNION WORKHOUSE;—ON TOWN INTERMENTS;—ON THE EXTENT OF THE NECESSARY SANATORY POWERS, AND IN WHOM TO BE VESTED;—AND ON THE BEST MODE OF REPAYMENT BY THE OWNERS OF PROPERTY FOR PERMANENT IMPROVEMENTS.

INTRODUCTION.

It is much to be lamented, but nevertheless true, that men are disposed to place great dependence on chance. It is scarcely doubted that certain operations and things may lead to illness and death; but there exists among the population of our towns an inertness and apathy,—an indisposition to effort, which is in direct proportion to the evils from which danger is to be apprehended. It is not denied, in the abstract, that ill drained and ill ventilated houses and workshops, or the contiguity of filthy privies, and other obnoxious places and things are prejudicial to health, but all possible excuses are made for supineness and inactivity by those who are the greatest sufferers from these causes.

"It was always so."—"We have lived in the house so many years, and don't like to remove." "We are not worse than our neighbours." "We must all die sooner or later." These and similar expressions we have frequently heard from persons whose health was being undermined, and their days shortened, by the unhealthy atmosphere existing around their dwellings. *Prostration of all remedial energy is produced by defective sanatory arrangements, as well as bodily suffering.*

It is a trite observation, and one that meets with general assent, that "Cleanliness is essential to health." In this short saying, however, lies wrapped up nearly the whole subject of sanatory reform, and the axiom must be repeated in all possible forms, until it shall have leavened the whole mass of society, ere the health of this and other large towns reaches that high standard which is certainly attainable.

Much may be done by legislative enactments, but we think the following report will shew how very much must still depend upon the voluntary exertions resulting from a general conviction that every man has a personal, social, and public duty to perform in this great work.

The labourer must feel that the health and comfort, and even the life of himself and his family depend upon an efficient sanatory system; the merchant and manufacturer, that the character and respectability of the workmen in his establishment are intimately connected with it; the medical practioner, that much suffering, disease, and death can be prevented; the political economist, that the energy and wealth-producing power of the country will be increased with the public health; the man of science, that the noxious matters which now poison the fountain of life, may be converted into the staple food of man and beast; and the professor of religion, that in promoting the health of towns, he is imitating the example of Him, "who went about doing good and healing all manner of sickness and all manner of disease among the people."

If it be possible, as we doubt not it is, so to improve the health of the town that the inhabitants shall approach in longevity those residing in country districts, then the want of sanatory regulations has caused the sacrifice of not less than 6,516 lives in the borough of Sheffield within the last six years, or, more than 1,000 per annum.

We think these considerations will sufficiently shew the importance of the inquiry upon which we are now entering.

We have endeavoured, in the following Report, to avoid, as much as possible, general observations;—to treat the various important subjects which have come before us, in a special manner, so that the whole may be strictly "A Report on the Sanatory Condition of Sheffield."

PHYSICAL GEOGRAPHY AND GEOLOGY OF THE DISTRICT.

The Borough of Sheffield, in the Wapontake of Strafforth and Tickhill, in the West-Riding of the county of York, includes the principal portions of the district to which the name of Hallamshire was anciently assigned.

The parish is situated at the southern extremity of the county, so that its boundary for more than five miles in extent forms the northern boundary of the county of Derby. The length from east to west is between nine and ten miles, and its width will average something more than three miles.

The Municipal Borough includes the whole parish.

The district for many miles in every direction lies upon the carboniferous system of rocks, and the entire borough (with the exception of a small portion of the township of Upper Hallam, where the millstone grit appears) lies upon the coal measures.

The general physiognomy of the neighbourhood is consequently that which is common to most coal fields, namely, an undulating surface, with bold swelling hills and deep vallies, affording an almost infinite variety of beautiful and varied scenery, and is very favourable for superficial drainage.

The principal river is the Don or Dun. Its source is a little above Dunford Bridge, at the eastern end of the Summit Tunnel of the Sheffield and Manchester Railway. Near Deepcar, about seven miles from Sheffield, it receives the waters of the Little Don, and about two miles lower down the Ewden. At the point where it enters the parish, the Rivelin and the Loxley fall into it. All these tributaries flow from the eastern slope of the Penine chain, and as the most distant has its source within 20 miles of the town, it will be evident that the stream must be exceedingly variable. After heavy rain, or the dissolution of a snow storm, it overflows its banks, and inundates the property near its course; while in a dry, hot summer, the whole of it forms but an inadequate supply to the works on its banks. No water is then allowed to run over the weirs, and the dry bed of the river becomes a depôt for the stagnant refuse of the population. It enters the town at the northern end, taking a south-easterly course to the Lady's Bridge, where being joined by the Sheaf, from which the town derives its name, it turns nearly due north, and about five miles below the town becomes navigable, with occasional locks, for vessels of 50 or 60 tons burden.

The Sheaf enters the parish at the upper end of Abbeydale, about four miles south of the town; and as it flows through the picturesque scenery of Beauchief Wood, its course, for about three miles, divides the counties of York and Derby. About half-a-mile before itself becomes tributary, it receives the waters of the Porter,—a brook having its source within the parish, at Fullwood, in Upper Hallam.

Thus it appears that the largest portion of the town is inclosed on three sides by rivers. From each of these rise bold slopes, giving to many of the streets such steep gradients that a pedestrian, accustomed to a more level neighbourhood, may soon weary himself. From the confluence of the Sheaf and the Don westwardly, the ridge of the hill is nearly identical with the course of the principal thoroughfare in that direction; and the rise from Lady's Bridge, through Waingate, Old Haymarket, High-street, West-street, and Glossop-road to Tapton, a distance of two miles, is about 400 feet. Beyond even the remotest suburbs of the town, the same ascent continues, until it reaches the highest point in the borough at Stanedge Pole, in the township of Upper Hallam, upwards of 1,100 feet above Lady's Bridge. From the confluence of the Sheaf and Porter, a similarly beautiful hill rises gradually, and terminates in the same locality. On the eastern side of the Sheaf (the site of the Park which once surrounded the Manor House of the Earls of Shrewsbury), the rise along the Intake Road, in about two miles, is not less than 450 feet. The ascent on the north side of the Don to the suburban village of Pitsmoor is still more steep.

The densely populated part of the town occupies a space of about 2¼ miles in diameter; and on the sides and summits of the hills above described, at short distances, are placed neat and elegant villas, belonging to the more opulent inhabitants. When we add that the sides of some of these sloping hills are clothed with forest trees, it will easily be believed that few towns can compare with Sheffield as to the physical beauty of its situation.

It is, however, to the geological position of the neighbourhood that it owes its commercial importance.

The coal measures in the district dip generally to the east, and the strike of the beds is consequently north and south;—they enter the parish from the direction of Unstone and Dronfield, and pass so entirely through the borough that one of the main seams lies under a large portion of the town. From hence their course is northerly to Barnsley and Leeds.

There are about ten seams of coal worked in the immediate neighbourhood, for the supply of the town; several of the lowest, however, constitute the gannister coal series, and are comparatively of little value, being chiefly used as engine coal, and occasionally for soft coke. Without descending to particulars, which might be tedious, we give a general section, from the upper seam, worked in this neighbourhood, not far from the lowest member of the new red sandstone system, and proceeding downwards to the millstone grit, with the locality of each; and shall incidentally name a few of the peculiar organic remains contained therein, for the purpose of comparison with other districts. We are not aware that a section of the whole of the coal measures of Sheffield has previously been before the public:

SECTION.

East of the Town.	1. **Coal Seam.**—Tinsley Park, containing Sigillaria, Calamites, Lepidodrenda, occasionally Ferns, and the usual common remains of the Coal beds	48 inches
	Shales, Bind, and Stone	13 fathoms.
	2. **Coal Seam.**—Fossils as above	27 inches.
	Shales and Bind	20 fathoms.
	3. **High Hazles Coal.**—Comprising seven distinct layers of Coal, with Fossils as above	45 inches.
	Shales, Bind, and the fine-grained Sandstone, about 40 feet thick, commonly called the "Handsworth Blue," ...	50 fathoms.
	4. **Handsworth Coal.**—Fossils as above	54 inches.
	Shales, Bind, Plate, Ironstone, and the bed of fine-grained ferruginous Sandstone, about 40 feet thick, forming the rock at Sky Edge, in Sheffield Park,	100 fathoms.
Under the town.	5. **Manor Coal.**—Extending under the Park above Bernard-street, and containing a greater quantity of Ferns and other delicate Fossils	60 inches.
	Beds of Clay and valuable Ironstone, containing Unios, and occasionally other Fossils, Shales, Clay, Bind, &c., and the fine-grained Sandstone, about 40 feet thick, worked at Claywood and Arbourthorne	55 fathoms.
	6. **Sheffield Coal.**—The Black Shale Coal, containing Fossils as above, excepting that Ferns are almost entirely absent. This seam extends under all the densely populated part of the Park, and has been worked under nearly all that part of the town which lies east of a line proceeding from the upper part of Hanover-street, by Rockingham-street, near West-street, to Solly-street, near Redhill; and also at Pitsmoor,	72 inches.
	Clay and Brown Shale with Ferns and Ironstone	10 fathoms.

West of the Town.	7. Coal Seam.—At Heeley, not worked	11 inches.
	Ironstone, Bituminous Shale, Gray Argillaceous Shales, and Stone Bind; Brinkcliffe Edge Flagstone, about 40 feet thick, Shale and thin-bedded Quarry stone	10 fathoms.
	8. Coal Seam.—Not worked	4 inches.
	Shale, White Rock, (the Sandstone commonly used for paving the streets, found at Greystones, Ranmoor, and Wadsley), about 40 feet thick; Stone Bind, Black Stone, Shale mixed with nodules of Ironstone, and containing Pectens, Goniatites, Nautili, Orthoceratites, Posidonia, and other Fossil marine shells	25 fathoms.
	9. Coal Seam.—With no Fossils distinguishable ...	27 inches.
	Gannister, full of Stigmaria	30 inches.
	Fire Clay, White Clay, Lidgate Rock, about 40 feet thick, Clay Shale, and Bind	14 fathoms.
	10. Rattler Coal.—Varying from 14 inches to 30 inches in thickness, say	24 inches.
	Fine-grained micaceous Flagstone, and Brown Slate, Black Shales, Rock, and beds of Fire Clay	15 fathoms.
	11. Coal Seam.—Not worked	4 inches.
	Thin Gannister, Spavin, and Shale ...	3 fathoms.

Millstone Grit.

From the above section it will be seen that the aggregate thickness of the coal seams is 10½ yards; that about 10 yards are workable; and that the most valuable seam lies immediately under the town. Any of the seams may be reached at a distance east or west not exceeding four miles. Beds of ironstone were wrought until about twenty-five years since within about half a mile of the parish church. The pits have been long disused, and the smelting of ore has recently been discontinued in the immediate vicinity of the town.

The section also shews, that there is generally a bed of freestone interposed between each seam of coal and the seam next below it; these furnish an abundant supply of grinding and millstones, common roofing slate, ashler and other building materials, paving and sewer stones, curbs and flags of excellent quality. Most of these beds have ferruginous waving lines, and marks upon them, giving a variegated appearance to many of the plain stone buildings of the town, which frequently excites the admiration of strangers.

There is one fact in connection with these beds of stone, which we believe has not been previously noticed, viz., that the Handsworth rock, the Sky Edge rock, the Clay Wood rock, the Brinkcliffe Edge rock, the Grey Stones rock, and the Lydgate rock, are in general terms, each 40 feet in thickness. This cannot be the result of chance, but must depend upon some unknown law, governing the alternation of land and water during the deposition of the coal measures.

It is also a fact worthy of notice that with the exception of Brinkcliffe Edge, each of these rocks becomes harder, more siliceous, and coarse grained, as we descend in the scale from the Handsworth bed to the Millstone Grit.

The total thickness of the coal measures in this neighbourhood is according to the above section 320 fathoms.

There are many faults and dislocations in the strata, and springs were formerly very numerous; but since the deep pit was sunk near the soap house, many, especially on the south side of the town, have been dried up. The spring water generally, contains a large quantity of earthy matter in solution, and is very hard; after a long season of drought it either becomes turbid or is lost. Scarcely any spring in the town is fit for washing and general domestic purposes.

The vallies through which the rivers, already described, flow, are raised in some places a considerable height by alluvial detritus. This alluvium, containing rounded boulders of considerable size, is frequently found at a distance of several hundred yards from the present course of the stream, and at an elevation of 30 or 40 feet above the river bed, clearly indicating that the river anciently flowed there; or, that a series of extensive lakes existed, and were destroyed before man took possession of the soil.

On every side of the town a fine rich loamy clay is obtained, suitable for red bricks, and in the lowest members of the coal measures, north and west of the town, there is abundance of of fire clay, an article necessary in the construction of the ovens, furnaces, and hearths, used to carry on the staple trade of the town.

The carboniferous limestone of Derbyshire, employed as a flux in the smelting of iron, is within 10 or 12 miles, and the cost is chiefly that of conveyance.

The magnesian limestone almost exclusively used for mortar, in building, is conveyed by water from Conisbro', and sold before burning for a few shillings per ton.

These important advantages, resulting from the physical geography and the geological position of the locality, added to the spirit and enterprise of its merchants and manufacturers, and theskill and ingenuity of its artizans, have made Sheffield famous for its cutlery and hardware, in every part of the globe.

The physical geography of the borough is also peculiarly favourable to the health and longevity of its inhabitants; to what cause it is owing that the rate of mortality is higher than in most other large towns we now proceed anxiously to enquire, and to suggest such measures as we think will best remedy the existing evils.

WATER SUPPLY.

It must be evident to all who have at all considered the subject, that no system of sanatory regulations can be carried into effect without an abundant supply of water. That water is, in fact, the only proper and economical agent to be used for removing the debris of the town. A constant supply is required in every house for domestic purposes; for flushing and cleansing house drains; for carrying to the sewers all excrementious and other noxious refuse, solid as well as fluid; for flushing and cleansing all court and street sewers and drains, and the traps of gully-holes; for constant washing of the surface of courts, lanes, and streets; for public and private baths, public buildings, and public conveniences; for extinguishing fires, and for stables, breweries, steam engines, and manufacturing purposes.

We are brought therefore to the enquiry:—

1. What quantity of water will be necessary for all these purposes?
2. Can the present Water Works Company supply the demand?
3. If not, from whence is the requisite quantity to be obtained, and by whom?
4. What will be the cost of constructing new works? and the price at which a sufficient supply can be brought to the town?

These, and other enquiries connected therewith, must occupy the patient attention of the Council for some time:—next to the inspection of the whole town, they have formed the most laborious, and, (from a consideration of the vested interests of the Water Works Company), the most difficult part of our investigations.

1. As to the quantity of water necessary for the supply of Sheffield. It will be obvious that all the engineering works connected with the sanatory improvement of the town, must be of a permanent character.

The sewers which we have constructed extensively in the township of Sheffield, within the last few years, and thos which remain to be executed, both in this and the other townships, as well as the whole of the house and other drains, are intended to drain the town, not only now, but when the population shall have greatly increased;—it is essential, therefore, if the whole of the refuse is to be removed by the agency of water, that the supply, reservoirs, pipes, &c., must be adequate, not only for the present population, but for future increasements of the town, during many years to come. Without such an arrangement, the time would soon arrive, when the drains and sewers would become only cess-pools for stagnant putrified animal and vegetable matter, and the inhabitants would be destroyed by pestilence, proceeding from the very means intended for its prevention.

The following table shews the increase of population within the borough, from 1801 to 1841, and also the population for the present year, and for 1857 and 1867, calculated according to the rate of increase shewn in the first four decinnial periods:—

Year.	Actual Population.	Population Computed at 2½ per cent. per annum Increase.
1801	45,758	45,758
1811	53,231	57,197
1821	65,275	71,496
1831	91,692	89,370
1841	112,492	111,712
1847		129,366
1857		169,707
1867		202,133

It appears, therefore, that this part of the enquiry must be based upon a supply for 200,000 inhabitants, anything short of this would be folly, in either a sanatory, engineering, or economical view of the question.

After long consideration, we are convinced that not less than 20 gallons per diem for each individual will be required, for domestic, sanatory, and public purposes. It would occupy too much space to enter into all the calculations upon which this quantity is founded, but it may be satisfactory to know that our opinion is confirmed by the following eminent engineers, with some of whom we have conversed on the subject:—Messrs. Wicksteed, Quick, Bateman, Homersham, and Hawksley; Mr. Holland, of Manchester, who has paid great attention to sanatory enquiries, estimates the quantity at 30 gallons. In a report presented by the Commissioners of Her Majesty's Woods and Forests, to the House of Commons, in February of the present year, it is stated that under the authority of an Act of Parliament recently passed, "for making preliminary enquiries in certain cases of applications for Local Acts," they had appointed George Wingrove Cooke, Esquire and James Meadows Rendel, Esquire, to hear evidence and report on the Supply of Manchester with Water. That report is enclosed with the report of Her Majesty's Commissioners, and after stating that "the BOROUGH of Manchester in 1841, contained a population of 235,507, these gentlemen submit as their opinion that no supply for the BOROUGH of Manchester ALONE will be permanently an efficient supply, if it is liable IN THE DRIEST YEARS to fall below 10,000,000 of gallons daily." We scarcely need say that Mr. Rendel is one of the most eminent civil engineers of the day, and that his opinion is entitled to great weight. If we take half the population of Manchester in 1841, we have 117,753. This is within five thousand of the population of Sheffield, at the same period, and we may therefrom infer the opinion of the Commissioners that 5,000,000 gallons per day, would be the minimum quantity required by this borough.

It will be interesting to see how nearly this appromimates to the quantity we have already estimated, 20 gallons per diem, for each of 200,000 inhabitants, is equal to 4,000,000 per day, to which we add a margin of *one-third* for stables, breweries, engines, manufacturing and other purposes, giving 5⅓ millions of gallons per day, as the supply required, or a gross quantity of 1946,666,666 gallons per annum.

2. Can the present Water Works Company supply the demand?

In considering this question, we must premise that any calculations for the supply of a town with water, will be fallacious, if founded upon the *average* depth of rain falling, as indicated by rain guages kept during a series of years; the same remark will apply in a less degree, to any average derived from the measurement of the streams which furnish the supply. In a dry year, not only do the inhabitants require a larger quantity of water than at any other time, but a much larger proportion of the rain falling is lost by evaporation, vegetation, springs, &c. In winter, three-fourths of the water will generally reach the reservoirs, but in an ORDINARY summer, not more than one-fourth.

In a year of extreme drought the proportion impounded will be still less. It is essentially necessary, therefore, that the DRIEST year should be taken for any calculations as to the quantity of water which can be supplied to a town.

The following Table shews the fall of Rain from the year 1836 to 1844 inclusive, according to the guage kept at the Redmires :—

Year	Inches in depth of rain.	Year	Inches in depth of rain.
1836	45.790	1841	46.340
1837	38.900	1842	33.775
1838	40.500	1843	43.645
1839	49.255	1844	30.145
1840	40.870		

The average of the whole nine years would be 41 inches. That of three consecutive years from 1842 would be 35 inches and a fraction. The latter showing a deficiency of *one-sixth*, as compared with the former, and it will be evident that any calculations based upon 41 inches would have been found erroneous in the year 1844 to the extent of one-fourth of the total supply.

In average years, nearly two-thirds of the fall will flow off the ground; but in a year like 1844, it would be unsafe to expect more than one-half. We thus obtain 15 inches *certain* of available water for the supply of the town from the Water Works Company's gathering grounds. The data assumed by James Simpson, Esq., the engineer to the Chelsea Works, when acting in 1845 as the adviser of the Millowners on the Rivelin against the Sheffield Company, nearly corresponds with this.

We have surveyed the gathering grounds of the Company, and find that on the most liberal allowance, the Redmires, or Wyming Brook gather, comprises 912 acres.

The open conduit collects water in its passage from Redmires to Tapton from about 540 acres, and the Hadfield and Crookes Moor Reservoirs from 280 acres, making a total of 1732 acres.

This area, at 15 inches available water, would supply annually 93,932,400 cubic feet, or 585,386,716 gallons, equal to 1,603,800 gallons per diem. Without the deduction of one drop of water for stables, breweries, engines, &c., the supply would only allow 12½ gallons per diem for each individual of the present population of 129,366; and if in twenty years the population should reach 200,000, the quantity would only be *eight gallons each,* if the whole were exclusively applied to domestic purposes.

In 1845 the Company stated their supply to be 1,250,000 gallons per day, which would give (deducting Sundays for the intermittent supply), 390,000,000 gallons per year. At that time they obtained an Act of Parliament authorising them to construct a compensation reservoir on the Rivelin for the Millowners, and then to divert the whole of the waters of the Wyming Brook to the purposes of the town. They have also powers to construct two large reservoirs in addition to the Redmires, and are bound by their Act to supply, within three years from the present time, every part of the town daily for at least eight hours.

The water rent on houses under £7 per annum, where the landlord undertakes to pay, is fixed by the Act of Parliament at 6s. 4d. each; in all other cases it is charged as a per centage upon the rental. The Company supplies 126 water closets at an average charge of 13s. 6d. each.

We beg to state that in our opinion thorough and efficient drainage of the town cannot be carried on without a constant supply of water;—that with an intermittent supply the inhabitants would still be burdened with the expense of butts, cisterns, and other receptacles, which have already cost no less than £10,000;—that water would still stagnate in the pipes;—and that if all other departments of sanatory arrangement were in efficient operation, the Company could not, with their additional works, supply every part of the town for two hours per day, if the two hours selected were in the early part of the forenoon, when most water is required. The high authorities we have quoted in corroboration of our own estimate, as to the quantity that will be required, sufficiently prove this.

The Company have been actuated by a laudable desire to furnish a larger quantity of water to the town, but have been unfortunately led into a great and useless expenditure in a wrong direction. They were aware that it was impossible to extend their present collecting ground at the Redmires, in consequence of its high level, and it would have been better to have broken new ground than to have increased the storage to so enormous an extent. The usual storage room provided for surface drainage water intended to supply towns, varies from 22,000 to 35,000 cubic feet per acre of gathering ground. It rarely exceeds the latter. If the third reservoir, which the Company have power to construct, be made, the storage here will be 106,725 cubic feet per acre, upon a ground where the fall of rain is far from being great.

The capacity of the Redmires is 30⅓ millions; the Lower Redmires 22 millions; and the Upper Redmires, not yet commenced is to be 45 millions. Total 97,333,333 cubic feet. Now, had there been no evaporation in the year 1844, nor any loss from vegetation or springs, if these reservoirs had been in existence, and no water had been drawn from them from the beginning to the end of the year, they would have contained the whole quantity which fell on the gather. 912 acres, at 30 inches, would yield 99,316,800 cubic feet.

It is to the extension of the gathering ground, or the discovery of a site for new works, and not to the increase of the storage beyond a certain well-ascertained limit, that we ought to look for increased powers of supply.

The water which the present company is able to supply is not equal to one-third of the quantity required.

3. From whence is the requisite quantity to be obtained, and by whom?

The Rivelin water is secured to the mill owners by the same Act of Parliament which enables the Company to appropriate the whole of the upper part of the Wyming Brook. If all this water from 3,600 acres were available, the supply would still be quite inadequate, nor would Parliament, so long as abundance of water could be obtained from another locality, lightly disturb the vested rights so recently considered and settled.

The very high level selected for the Company's Works renders it impossible to extend the gathering grounds so as to bring additional water into the Redmires reservoirs without pumping; our attention was, therefore, next directed to the practicability of bringing an additional supply to the Hadfield and Crookes-moor reservoirs, so as not to involve the necessity of altering the service mains and pipes.

The most convenient situation for such an extension appeared to be the River Porter, because a conduit from it might pass along the side of the hill to the service reservoirs. Our first attention was therefore directed to this stream. From 816 acres above Fullwood Mill, there might be collected, at the same depth of rain as already allowed for the Redmires, 45,567,450 cubic feet of water per annum. From this, however, must be deducted the compensation supply which would be claimed by the millowners. Estimating this at one-fourth the minimum claimed by the Rivelin mill owners (which is about the proper proportion), or 150 cubic feet per minute, for 12 hours of each working day, the total quantity remaining for the inhabitants of Sheffield would only be 11,871,450 cubic feet, or 73,972,776 gallons per annum. The supply from this source would only equal a fortnight's consumption, and to obtain it would cost at least from £15,000 to £20,000.

The Sheaf and its tributaries receive the waters from a considerable area, but there are many reasons why it would be ineligible as a source of supply. Much of the ground is under the plough; there are roads, buildings, and other obstacles, which it would be difficult and expensive to remove from the places most suitable for reservoirs; almost every inch of fall upon the river is occupied, and consequently a large compensation would be demanded. We are compelled to add that the works would have to be almost entirely distinct from the present—that they would be very expensive, and that the supply would still be very much below the increasing requirements of the town.

From 1880 acres of the Bamford, Moscar, and Derwent Moors there could be drawn 109,190,400 cubic feet, or 680,474,572 gallons per annum—assuming an available depth of 16 inches of water upon the whole gather; because the quantity of rain falling there is, from its westerly aspect, greater than at the Redmires. The daily quantity from this source would be 1,864,313 gallons, which, added to the extreme quantity the present works can afford, would give 3,468,113 gallons per diem, or scarcely two-thirds of the quantity required. The deficiency would still amount to nearly two millions per day. It must also be remembered that this addition could not well be connected with the present works nearer than the Hadfield reservoirs, because the outlet of the tunnel into the Rivelin Valley, would be 100 feet below the Redmires reservoir; and, therefore, with the exception of street mains, &c., this would be almost a new set of works. The cost of reservoirs, catchwater drains, tunnel, and main pipes, to the Hadfield reservoir, would be £96,000. Some compensation, though not great, would be claimed by the works on the Derwent, between Mytham Bridge and Ladybower Brook.

The mill owners on the river Loxley, some years since, purchased two plots of moor land, containing together about 200 acres, with the intention of impounding flood-water to supply their mills during seasons of drought. For some reason, however, these reservoirs were never constructed.

In considering the best means of affording a constant supply for the inhabitants of Sheffield, under the difficult circumstances already described, we proceeded to ascertain,—what quantity of water could be obtained from the whole of the district draining into the Loxley, above Bradfield;—what would be the probable compensation to the mill owners;—whether the works could in any way be connected with those of the Water Company; and, if not, whether the surplus, after supplying the mill owners, would be sufficiently large to warrant the construction of new works.

The first plot of land in question is 85 acres, situate behind the Strines public-house. A reservoir of 20 acres, and 25 feet average depth, might be formed here to receive the drainage of 544 acres of land. The other site is upwards of 100 acres at Agden Bridge, on another tributary to the Loxley, about 2½ miles to the north of the former;—here a reservoir of 30 acres and 35 feet depth could be made to impound the water from about 1200 acres of collecting ground.

These two would be amply sufficient storage for all the water falling above their levels, and if they were entirely devoted to the use of the town, the supply from this source would be 591,795,705 or 1,621,358 gallons per day;—equal to eight gallons each per day for a population of 200,000, taking the depth at 15 inches as in the Redmires. It next became a question whether a sufficiently large compensation could be provided at a lower level to satisfy the millowners, after this water had been abstracted.

The largest works on the River Loxley are those of Samuel Newbould & Sons; they have a dam of about three acres, and a great head and fall. Their works, in a time of good trade, and when they have sufficient water, scarcely stop throughout the twenty-four hours; the quantity of water, therefore, which they would require would be very large.

The gathering ground of the Loxley above Bradfield is 6820 acres, which is nearly double that of the Rivelin. Above Messrs. Newbould's works it is considerably more than double. If, therefore, we allow them a stream of 24 cubic feet per second, which would be equal to two horse power upon every foot of fall, for only 12 hours per working day, we shall be compelled to deduct 323,481,600 cubic feet as compensation, from 371,349,000 cubic feet, the produce of 6820 acres, the remainder would be 298,309,636 gallons or 817,287 gallons per day.

The water level of the Strines reservoir would only be 937 feet above the Sheaf Bridge (three feet below the level of the Redmires;)—the Agden Brook reservoir would be 880 feet above the same point; and the Moscar reservoir 907 feet, so that the three sets of works would be entirely distinct as to the Store reservoirs and conduits.

We will now sum up the result of our attempts to bring additional water to the Hadfield and Crookes-moor reservoirs, with the probable cost of the works, including the present Company's supply, and probable cost of their store and service reservoirs and pipes.

Source of Supply.		Quantity per day in Gallons.		Probable Cost of Works.
The Water Works Company	...	1,603,800	...	£150,000 0 0
The Porter Brook Valley ...	...	202,665	...	20,000 0 0
Moscar and Derwent Moors	...	1,864,313	...	96,000 0 0
Loxley Valley, Strines, and Agden		817,287	...	104,000 0 0
Total	...	4,488,065	...	£370,000 0 0

From the above table it appears that 4,488,065 gallons per day could be obtained from these sources.

The quantity required is 5⅓ millions per day for a population of 200,000. Within 20 years from the present time, therefore, there would exist a deficiency of not less than 850,000 gallons per day, *without any possibility of further extension,* and after an expenditure of £370,000. At that time, if not sooner, a new site would have to be found, not only for storage, but also for service reservoirs, involving the further expense of making necessary alterations in the street mains, &c. We are induced to inquire if it would not be better to do it now; and whether a much larger quantity of water cannot be brought to Sheffield at a less cost, without prejudice to the interests of the shareholders in the present Water Company, and with the power of extending the works still farther if the requirements of the town should out-grow the supply.

We feel bound to state that throughout the whole of our surveys and calculations, we did not look for additional gathering ground and storage until we were convinced that the Redmires was totally unable to supply the town; and that we still clung tenaciously to the Hadfield and other service reservoirs, until the inadequate supply from all the sources which we have been considering, with the impossibility of further extension, and the great cost of three separate works, compelled us to relinquish our hold, and make a further investigation.

Our inquiries commenced on the south-west of the town, at the streams nearest the present works, and we were gradually driven farther to the north, and to a greater distance, as the deficiency became from time to time apparent, until the only streams remaining for our consideration were the Ewden, the Little Don, and the Don. To these districts we now direct the attention of the Council.

We have carefully examined these gathering grounds, and have found excellent sites for reservoirs, in the district of the Little Don River, from whence the water might be brought by open conduit, collecting along its course; and by a short tunnel, into the valley of the Ewden, where other reservoirs, catchwater drains, and conduits, could be constructed above Broomhead Hall, and from thence along the south side of that valley, over the ridge near the Spout House, to Tinker Brook, which is within a mile of Oughtibridge. At this place is an admirable site for a service reservoir, and if necessary, filter beds, from whence an abundant supply of pure water for all domestic, sanatory, and trading purposes could be conveyed by pipe along the road to the town, with a pressure of from 250 to 300 feet.

It has been proved by rain-guages placed within a mile or two of this district, that a much larger quantity of rain falls there than in the neighbourhood immediately to the west, or south-west of Sheffield.

From the admeasurement of the streams, and from guages placed on the moors, over and near the Summit Tunnel of the Sheffield and Manchester Railway, it has been stated in evidence that there is an average fall of 60 inches of rain per annum; and that 36 inches of available water might be obtained. This large amount was controverted, but it was admitted by the Railway Company, in opposition, that 24 inches could be collected in the reservoirs in a dry year.

If the geological and physical character of the districts be at all similar, the proportion which the water flowing of the ground will bear to the total depth of rain falling, will be larger in the district in which the greatest quantity of rain falls, because the quantity lost by absorption and evaporation will be about the same in both. If, therefore, 15 inches were secured from a fall of 30 inches, we might expect to obtain, at least, 36 inches in the reservoirs, from a depth of 60 inches. As the accuracy of these guages, however, was disputed, and we have not had opportunities of measuring for ourselves, either the fall of rain or the flow of the streams, we determined that, in a matter of so great importance, these preliminary enquiries should proceed in the most cautious manner, so that the supply may never, in the driest year, fall below the estimated quantity. In the following calculations, therefore, we have assumed 20 inches in depth as the supply which can be brought to the town of Sheffield, from this district.

The whole area of the collecting grounds thus provided is 11,807 acres, and the total quantity of water which may be impounded is 5,341,996,862 gallons. The question of compensation to the owners of works on these streams, and on the Don below Deepcar, immediately presents itself, and we must necessarily assume a sufficient supply for them from the total yield of the district. It must be borne in mind that, *at present,* we do not propose at all to interfere with the River Don above Deepcar, and therefore we think that the large compensation we have supposed to be given for the obstruction of part of the waters of two of its tributaries would probably, when that river is high, and a large volume of water flowing past them, be injurious to their interests. We do not say that they have a right to so large a compensation, that would be matter of future arrangement, but for the purpose of ascertaining the supply available for the wants of the borough, under extreme circumstances, we should be able, if necessary, to deduct 3,023,905,996 gallons, which would be a compensation equal to two horse power for every foot of fall upon the Little Don River; one horse power upon the Ewden Brook, and three horse power upon the River Don, secured to them for 12 hours of each working day. The remainder is equal to 6,350,934 gallons per diem, throughout the year, or 31½ gallons for each of 200,000 inhabitants for domestic, sanatory, trading, and other purposes, all inclusive.

The water, like that of the Redmires, flows off the millstone grit, which is acknowledged to be the best stratum in existence for domestic and other purposes, requiring soft water. According to Dr. Clarke's test, the degree of hardness is only one and a fraction, while the quality supplied to London, and many other large towns, is from 13 to 17 degrees;—this is an important consideration in connection with sanatory regulations.

There is some peat on the high lands, and it is probable that when rain falls after a long dry season, the upper part of the streams would be coloured brown, but its passage along the bed of the stream,—through the store reservoirs, and the conduit, would entirely remove the colouring matter, by a process of natural filtration, and render it perfectly colourless and pellucid before it reached the service reservoir. It is probable, therefore, that the construction of filter beds would be unnecessary.

Without plans prepared for the purpose of constructing the works, it is impossible to give more than a rough estimate of the cost, but we have carefully examined the whole of the district, and coloured the accompanying plan so as to shew the gathering ground in purple, and the reservoirs, conduits, &c., in blue. From the best calculations we can make, under present circumstances, we have no doubt that the whole of this abundant supply could be brought to the town for £150,000.

The area of the Little Don gather is 5,720 acres; that of the Ewden Brook 5,428 acres; and that of the Tinker's Brook 650 acres. Fixing the storage at 30,000 cubic feet per acre, we shall require at an average depth of 30 feet in the reservoirs, for supply and compensation, 132 acres of reservoir room for the Little Don waters;—124 acres for the Ewden Brook; and about 15 acres for the Tinker's Brook. As the last, however, is to receive part of the waters from the other vallies as well as from its own proper ground, we have allowed 23 acres of reservoir; making a total storage of 364,597,200 cubic feet, or 2,272,169,750 gallons. The daily supply for the millowners and the public will be 16,042,940 gallons, and this storage would be equal to 140 days supply, which would carry the public, and the millowners, through the longest period of entire drought which is ever likely to be experienced in this country.

The following is the estimate already alluded to:—

		£	£
Little Don Valley:			
The Little Don Reservoir	50 acres.	10,500	
Shaw Brook...	32 ,,	9,000	
Little Don Compensation Reservoir	50 ,,	11,000	
			30,500
Acres	132		
Ewden Valley:			
The Ewden Reservoir	60 acres.	13,000	
White Lee Moor	24 ,,	6,000	
Ewden Compensation Reservoir ...	40 ,,	9,500	
			28,500
Acres	124		
Tinker Brook Service Reservoir	23 acres.		11,000
Tunnel from the Little Don to Ewden Valley, 1,000 yards, at	£6 10s. per yard =		6,500
Conduit from the Little Don to Shaw Brook Reservoir; from thence to the Tunnel; from the Tunnel to Ewden Reservoir; from thence to White Lee Moor Reservoir; and from thence to Tinker's Brook Reservoir, 7½ miles, at...	£900 per mile =		6,750

	£
24 inch main along the Turnpike Road from Tinker Brook Reservoir to Sheffield, 6 miles, at ... ... £3 7s. 6d. per yard =	35,244
	£118,494
10 per cent for contingencies	11,849
	£130,343
Land and compensation for damage, &c.	19,657
	£150,000

This scheme has the further advantage, that at any future time, if the necessity should arise, it could be extended to the valley of the Don, so as probably to double the supply now proposed.

To those whose habits and occupations have led them to think long, and deeply, on these subjects, the working of an *efficient* system of drainage is so essentially connected with the distribution of the water supply, that the idea of the two being separated, under different managements,—the drainage being public, and the water supply private,—appears equally as absurd as if a man were to use his own hands to feed himself with solid food, but were to pay some other person to give him drink, to dilute, digest, and carry it off.

In a communication made more than five years since by Mr. Lee to a person holding high office in London, on defects in the General Highway Act, he said, "I have not hastily formed the opinion that Gas and Water Works ought to be public property." Since that time persons, whose opinions are entitled to greater weight, have spoken to the same effect. The 17th and 18th Recommendations of the Health of Towns Commission are—"That it be rendered imperative on the local administrative body charged with the 'management of the sewerage and drainage to procure a supply of water in sufficient quantities, not only for the domestic wants of the inhabitants, but also for cleansing the streets, scouring the sewers and drains, and the extinction of fires.'" "That the local administrative body be empowered to purchase the interest in Water Works, subject to the control of the Crown, whenever the proprietors are willing to dispose of them." And, "That on the establishment of new companies, it be made a condition, that the local administrative body be enabled to purchase the works, after the lapse of a certain number of years, upon certain terms, and upon a rate of interest to be fixed."

The Report of the Committee on Local Acts, 1846, contains the following :—"That all Water Works, all works for drainage of towns, for sewerage, and for paving, should, if possible, be carried out under one and the same local authority."

Clauses for carrying these recommendations into effect were proposed by Lord Morpeth a few weeks since, as an amendment to the Health of Towns Bill on its re-commitment.

Within the last month a Committee of the House of Commons on competing Bills for supplying the town of Manchester with water, passed a resolution—"That in the opinion of this Committee it is not expedient that the distribution of water within the borough of Manchester should be in any other hands than those of the Corporation."

We have no hesitation, therefore, in saying that, along with the sewerage and drainage, the Water Works of Sheffield ought to be public property, under the management of the Corporation.

In that case the public would get their supply at cost price, and the interest of the capital expended in the construction of new works, being secured by the public rates, the money would probably be obtained at 4 per cent., which, upon the estimated expenditure of £150,000, would be £6,000 per annum. To this must be added the cost of management, taxes, &c., not exceeding £2,500, if filtration of the water should be found unnecessary, making the price of the water when ready for distribution considerably less than $\frac{7}{8}$ths of a penny per thousand gallons. If we were to add £50,000 for street mains, which already exist, and for a service pipe and tap into every house, the price would only be $1\frac{1}{10}$d. per thousand gallons. Again, twenty gallons each person, and five inhabitants per house, which was the number in 1841, would make 700 gallons per house for each week, the value of which would still remain less than 1d. per house at the end of twenty years from the present time. Reversing the mode of calculation, we arrive at nearly the same result. 200,000 inhabitants, at five per house, would occupy 40,000 houses, which, at 1d. per week each, would produce £8,666 per annum. If it be objected, that in the latter mode of calculation, no allowance is made for the necessary extension of street mains and services during the twenty years, we reply, that at $2\frac{1}{2}$ per cent. per annum, which corresponds with the increase of the population, the addition would amount to the capital sum of £25,000, the annual interest of which would be £1,000. To balance this, we have taken no credit for water supplied for trading and other purposes, which yielded last year to the Water Works Company £714, and which will increase during the next twenty years, in at least a similar ratio to the population.

The time is fast approaching when a supply of water will be required for many purposes to which the Company's water has never been applied;—such as the washing the outsides of houses, and buildings; and the watering of gardens by the hose and jet. All these would be a source of considerable profit.

We do not recommend that all houses, irrespective of their size and consumption, should be charged only one penny per week; the calculation has been entered into for the purpose of shewing the cheap rate at which an abundant supply of water may be given to the inhabitants of the town by the Corporation, if the new works be the property of the burgesses.

It has been stated already that the quantity distributed by the Company in 1845 was 1,250,000 gallons per day. Their receipts for the last year (1846) were £10,502 1s. 3d., making the price of water to the consumer 6½d. per thousand gallons.

We give the comparison only for the purpose of strengthening the argument in favour of the works being public property, and not to excite any prejudice against the Company. The public have no right to expect that a number of gentlemen, many of whom may not be inhabitants, will be sufficiently patriotic to expend their fortunes in supplying the town with water, unless they have reason to expect a considerable return in the shape of dividends. The undertaking is at the outset a speculation; it may be bad, or it may be good. In the present instance the Company has realized 7½ per cent. We do not take upon ourselves to say that this is too much, or too little; but we think they must be treated as a trading company entitled to a fair and proper return for their capital invested.

The Corporation will no doubt have to treat with the Company for the purchase of the present works. It forms no part of our duty to consider the monetary conditions of such an arrangement. The Water Company are able to protect their own interests; and the Council, while they are jealous of the interests of the burgesses, will not wish to sacrifice to public necessity a Company protected by an Act of Parliament passed, with their sanction, within the last two years.

Our opinion is that a certain annual sum of money, to be agreed upon between the parties, as a satisfaction for all the works, should be guaranteed to the Company on the security of the public rates; such sum to be paid by the Treasurer of the Corporation to the Chairman for the time being of the Company, and by him disbursed to the shareholders.

In the event of the present Company's Works becoming public property, and new works being constructed, the Redmires and Hadfield reservoirs would be used for as much of the highest parts of the town as they were capable of supplying; and the street mains would have to be altered and adapted to the two sets of works entering the town from different quarters. We are convinced that under one general management both of the pavements and the water supply, great economy would result from laying the pipes under the footpaths, so as to avoid the constant disturbance of the carriageways, and that a large amount would be saved by the adoption of iron service-pipes and taps, especially under a system of constant supply at high pressure. These might be laid by the fitters employed by the Corporation, and the portion in the interior of the building charged to the owner of the property at cost price. They would not be so liable to injury; there would be no temptation to steal them; and the value of the old lead pipe and brass tap would nearly pay for the alteration.

Happily fires are not of so frequent occurrence in Sheffield as in many other large towns. They do, however, occasionally occur, and it is our duty to state that a constant supply of water, at high pressure, offers the best means of extinguishing the devouring element. A three inch main, the smallest that would be put down in any street, will afford a 40 feet jet; which is equivalent to keeping the power of one engine and 20 men at every door, ready to act at a minute's notice, after the first alarm of fire.

In concluding this important branch of our subject, we beg to acknowledge that the Water Works Company promptly answered all our written enquiries, and offered to give us any additional information that would assist our investigation.

DRAINAGE.

The subject for our consideration, next in importance to the water supply, is Drainage:—the efficient drainage of all streets, lanes, courts, houses, and buildings.

The existing sewers in Sheffield have been, ostensibly, constructed under the authority of the Highway Act; but that Act does not, in reality, confer the power to make a sewer to drain any building, or even contemplate the existence of a sewer, in the proper sense of the term. The 67 and 68 sections give the surveyor authority "to make, cleanse, scour, and keep open, all ditches, trunks, tunnels, plats, and bridges," &c., words utterly inapplicable to the drainage of a town like Sheffield;—the framer of the Act had, no doubt, before his mind at the time some agricultural parish, in a level part of the country, where deep ditches are made under the hedges along the sides of the road, to drain off the surface-water laterally, and the "trunks, tunnels, plats, and bridges," were merely to give the farmer access to his fields. It would perhaps have been more correct to have said that the sewers in Sheffield have been constructed without any Act of Parliament;—in fact, that the people had, *to some extent*, discovered sooner than the Legislature, the intimate connection which exists between filthy habits, disease, degradation, and vice, and the absence of Sanatory regulations; and had endeavoured, under all possible difficulties, to remedy the evil.

Tradition states that the surplus water from Barker's-pool formerly ran on the surface down the middle of Fargate, High-street, and Haymarket (then Prior-gate and Bull-stake), to the river. This in time became an intolerable nuisance in the principal streets of the town, and a covered sewer was made,—the first in Sheffield. About the same time, from the manner of its construction, a sewer was made from the Watering-place near the bottom of New Hall-street, through what must have been unoccupied land, to the top of Love-street; it was extended within a very short period afterward past the Old Workhouse to the bottom of Broad-lane, and a third was formed from the Sheaf Bridge to the bottom of Duke-street in the Park. These, though only from 6 to 8 feet in depth below the surface, might well shame in their construction the many miles of worthless drains put down in the new streets within the last 50 or 60 years. There is no record when these three were constructed, and very little more appears to have been done by the public authorities until about 1825, when the sewer from the bottom of New Hall-street to Love-street was replaced by one at a lower level extending from Messrs. Vickers floodwash under the Isle to Love-street. This was done for the purpose of an extension along Spring-street, but for want of proper plans and sections the level was lost, and there is always an accumulation of foul water and sediment more than a foot deep. During the next nine years an enormous amount of mischief was done, which the inhabitants of Sheffield have since had to pay severely for, and the township of Ecclesall Bierlow has yet to contend with. Sewers were constructed about seven feet deep, with flat bottoms, dry, rough rubble sides, covered with flat stones, and were laid down without plans, or any regard to levels. But this was not the full extent of the evil,—private individuals were also at work; the town was rapidly extending, much building was going on, and similarly constructed drains, though seldom exceeding twelve inches square, were made in many places where no sewers existed. One builder constructed such a drain from the nearest sewer to the houses he was erecting, his next neighbour continued it to his, and so on, until what was originally intended only to drain a few houses had to serve a whole street, and to complete the folly, the Surveyors of the Highways immediately inserted street grates into such drains, and adopted them as public sewers. Nearly the whole of these, in the township of Sheffield, have been taken up and reconstructed upon proper principles. The sewer in High-street and Fargate has also been lowered to 13 feet deep, and that from Love-street to Broad-lane enlarged, and reconstructed at a depth varying from 10 to 15 feet deep. The old sewer in Broad-street has been superseded by one crossing the New Haymarket, and, as we shall hereafter shew, very little now remains, in the township, that will require reconstruction, in order to a complete system of drainage. The ill-formed sewers we have named, became, from time to time, pests, and it was necessary to proceed with the work of reconstruction, to the neglect of many urgent claims for new sewers; so that nominally, the extent of sewerage has only increased during the last nine years, from about eight miles to between 12 and 13 miles. In the township of Ecclesall Bierlow, all the sewers, excepting two made the last year, and extending about half a mile, will require reconstructing. In Brightside Bierlow and Nether Hallam there is, we believe, scarcely an exception.

In all the old sewers, side drains, and drains from buildings, the junctions formed right angles. In the township of Sheffield, the junctions of all made within the last 12 years are semicircular, of the largest radius possible under the circumstances. This prevents accumulations above the point of connection.

Much has been said latterly on the best forms of sewers; now, if we have given the quantity of water in motion, the friction will be in direct proportion to the area of the surface of its channel, and the velocity nearly as the square root of the depth of the stream, and consequently that form will possess the greatest scouring action which presents the greatest depth of stream combined with the smallest surface of channel.

It was from calculations of this nature, and from a consideration of the relative proportion of the maximum and minimum flow through the same sewer, that Mr. Lee was led in 1835, to adopt the egg shape for the sewers in the township of Sheffield; and it was exceedingly gratifying to him to find, in the Sanatory Report of the Poor Law Commissioners, published in 1842, diagrams shewing that the same form was in use in the Holborn and Finsbury district of sewers, and a recommendation of it, as the best and most economical that could be devised. We were surprised, therefore, to find recently, in a publication devoted to constructive science, a letter in which the writer claims the invention of this form of sewer. Mr. Lee never claimed any invention, nor does he now, but we mention the fact, because the Council know, many of them having been members of the Highway Board, that this form of sewer was used in Sheffield for many years before that time, and they will now be satisfied that it is the best.

Further consideration led him to adopt stone, cut to templets, for the lower part of the sewer, closed in by a semicircular arch composed of a single ring of key-bricks. The next arrangement was to divide the sewers into six classes, of transverse sections, one or other of which, has been found so suitable, that we believe that there is not more than one instance in which any sedimentary matter has been deposited.

The following table shews the greatest inside dimensions of each, and the price at which they are at present constructed, at the minimum depth; viz. 10 feet:—

Class.	Height.		Width.		Price per Lineal Yard.		
	feet.	in.	feet.	in.	£	s.	d.
1	5	6	3	4	1	0	0
2	4	0	3	0	0	17	0
3	4	0	2	6	0	16	0
4	3	6	2	0	0	14	6
5	3	0	1	9	0	13	0
6	2	6	1	6	0	12	0

These sizes are being laid down in the streets on the principle that a sewer ought always to have as great a depth of water flowing through it as possible, but that it should still be large enough to receive a heavy thunder shower.

The base of the whole system when complete will be a series of mains, throughout the town, running parallel with the Sheaf and the Don. The first commencing at Highfield, and proceeding through Little Sheffield, into the township of Sheffield, at Sylvester-street, along Arundel-street, Sidney-street, Brown-street, Pond-street, Shude-hill, and the Killing Shambles. The second commencing at Lower Philadelphia, or Hill-foot, and proceeding by Green-lane, Spring-street, and Bridge-street, through the Killing Shambles, where becoming united to the first, the combined stream will pass under the bed of the river, near the Circus, receiving in the Cattle Market, the Park drainage, brought by the third main, from the bottom of Duke-street. These united streams will then, in one large culvert, be conveyed along Effingham-street, past the Gas Works, through the fields, and again under the river to Salmon Pastures. The fourth main would come down Pye-bank from Pitsmoor, proceeding through Bridgehouses, the Wicker, Saville-street, and passing under the goit, near the weir, at Burton Head, would discharge itself at the same place. The last would come through Attercliffe to the bridge, and discharge itself with the others at the Salmon Pastures.

By this system, the whole of the drainage of Sheffield, Ecclesall Bierlow, Nether Hallam, Brightside Bierlow, and Attercliffe, would be entirely removed away from the dense population,—brought to one focus,—and discharged at the lowest possible level.

Previously to giving a tabular view of the sewers to be constructed, it is desirable to make a few observations on house and court drainage.

Very great expense is frequently incurred by owners and occupiers of property in the construction of inefficient drains, and subsequent disputes arise between them and the persons they have employed, respecting the repair of bad work, and the maintenance of the pavements; besides this, the public suffers from improper insertions into the sewers, from the loose manner in which the soil is thrown into the trench, and from the subsequent damage to the street. If the construction and management of the whole were in the hands of the same body as the public drainage, it would be more perfectly executed in the first instance,—would require less subsequent attention, and would be done at considerably less cost.

The best house and court drains now made in the town, are of brick, and seldom less, even for one house, than 12 inches square. The most common material, however, is rubble stone, walled dry, and frequently even without sheeting-stones in the bottom. What wonder can there be that they become choked with refuse in a very short time, and that the inhabitants are almost poisoned with the stench? At the time to which we have alre ady alluded, when Mr. Lee classified the different sizes of sewers, since used in the town, he also laid down, upon the same sheet, transverse sections of the best sizes and forms of house and court drains. According to this plan, the whole of the drains for houses would be earthenware glazed pipes, from three to six inches in diameter. A copy of the Plan was afterwards presented with his Report to the Health of Towns Commission.

About four years ago he made a set of full sized working drawings for earthenware pipes and traps for all houses, courts, gully-holes, and short streets, and communicated with all the potteries within a circuit of 20 miles, endeavouring to induce them to commence the manufacture; but having no controul over the private drainage of the town, he could not ensure a demand, except for the larger diameter of eight inches and upwards, for the public drainage; and for the construction of these, only, none of the potters could be induced to provide the necessary apparatus.

These plans have been now some time in the hands of a respectable and enterprising brickmaker in the town, who has made many enquiries and journeys on the subject; and it is to be hoped that earthenware pipes may yet be brought into general use for all such purposes. It must be evident to all thinking persons that if a pipe of an inch diameter is sufficient to supply a house with water, a very little increase in size will be necessary to carry away the refuse which will accompany it, and also the drainage of the roof.

More than three-fourths of the houses in Sheffield might be drained to the sewers, without any of the present offensive accumulations, by pipes of not more than 3 inches in diameter.

The economy would be of a two-fold character:—First, the contracted size of the drain would give the greatest possible power to the water with the least amount of friction; and, secondly, the small extent to which the street would be disturbed, and the low price at which pipes could be supplied, added to the efficient and permanent character of the work, would effect a considerable saving in money expenditure.

Traps have been very little used in Sheffield, and, except with small pipes, such as we have been describing for houses, it would be impossible to use them generally, so long as the supply of water continues in its present inadequate condition. The stone used for our streets and buildings is of a friable nature, and produces a large amounts of sand, and other heavy sediment. A great quantity of ashes and cinders from manufactories, are used to cover the surface of inferior streets and courts; so that, when heavy rain begins to fall, especially after a season of drought, there is so much of this pulverised matter suddenly removed, that the street grates, two feet long, and one and a half feet broad, with openings between the bars about two inches wide, are frequently buried, and the water rushes along, until it has deposited a great portion of its sediment, before it finally escapes into the sewer. Under these circumstances, it will be evident to any person at all acquainted with hydraulics, that the form of the trap would so increase the friction, and diminish the velocity, that substances previously held in suspension by the fluid, would be dropped, the traps would become choked, and the lower parts of the town inundated with the overflow of every heavy shower. This would not be the extent of the evil; because the choked-up traps would immediately generate the noxious gases they were intended to prevent.

Within the last 12 years Mr. Lee has several times put down traps in the street gully-holes, but has invariably been compelled to remove them, in consequence of the heavy complaints made of the stench by persons living near to them.

It is an error to suppose that the interposition of water is alone a sufficient protection against the escape of noxious gases from sinks and drains; such is not the fact; as soon as the water is saturated with the gas, it escapes into the house or street to the injury of the health of the inhabitants. It is only when the water supply is abundant, and the trap constantly replenished, that the escape of gas is effectually prevented.

We are fully convinced that under any complete system of town drainage, every opening into the sewers, public or private, must be securely trapped. But the various branches of sanatory reform are so inseparably connected together, that we are firmly persuaded this cannot be done efficiently until the courts, lanes, and bye-places are properly paved,—the whole surface of the town constantly cleansed, to prevent the large accumulations of loose matter, now only removed by rain,—and above all, until a much larger supply of water be obtained—a supply sufficient to remove immediately the whole debris of the town.

Before presenting the following Tabular Statements, we must premise that the present extent of public sewers in the township of Sheffield is from 12 to 13 miles;—that of Ecclesall Bierlow, about five miles;—Brightside Bierlow, perhaps one mile; which, as already stated, would require entirely re-constructing, and is therefore treated as new. Nether Hallam and Attercliffe may be said to be without sewers:—

Township.	Description of Sewer.	To reconstruct	To construct	Price.			Estimated Cost.			Total.		
		Yards.	Yards.	£	s.	d.	£	s.	d.	£	s.	d.
Sheffield.	Main.	1177		3	5	0	3825	5	0			
			3080	3	10	0	10,780	0	0	14,605	5	0
	No. 3	440		0	15	6	341	0	0			
	4	440		0	14	0	308	0	0			
	5	880		0	12	6	550	0	0			
	6	781		0	11	0	429	11	0			
										1628	11	0
		1 mile, 781 yards.										
	No. 3		220	0	16	0	176	0	0			
	4		902	0	14	6	654	4	0			
	5		2,398	0	13	0	1588	14	0			
	6		29,304	0	12	0	17,582	8	0	20,001	6	0
			18 miles, 1144 yds.							36,235	2	0
Ecclesall Bierlow.	Main.	242		3	5	0	786	10	0	786	10	0
	No. 3	660		0	15	6	511	10	0			
	4	1320		0	14	0	924	0	0			
	5	2640		0	12	6	1650	0	0			
	6	3146		0	11	0	1730	6	0	4815	16	0
		4 miles, 726 yards.										
	No. 3		165	0	16	0	132	0	0			
	4		1012	0	14	6	733	14	0			
	5		1980	0	13	0	1287	0	0			
	6		9020	0	12	0	5412	0	0	7564	14	0
			6 miles, 1617 yds.							13,167	0	0
Nether Hallam.	No. 4		1320	0	14	6	957	0	0			
	5		1320	0	13	0	858	0	0			
	6		5720	0	12	0	3420	0	0	5247	0	0
			4 miles, 1320 yds.							5247	0	0
Brightside Bierlow.	Main. }											
	No. 1 }		1364	1	0	0	1364	0	0			
	3		220	0	16	0	176	0	0			
	4		3014	0	14	6	2185	3	0			
	5		1276	0	13	0	829	8	0			
	6		4224	0	12	0	2534	8	0			
										7088	19	0
			5 miles, 1298 yds.							7088	19	0
Attercliffe-cum-Darnall.	Main. }		1320	0	14	6	957	0	0			
	No. 4 }		1320	0	13	0	858	0	0			
	5		1870	0	12	0	1122	0	0	2937	0	0
	6											
			2 miles, 990 yds.							2937	0	0

SUMMARY.

Township.	Total extent of Sewers to renew and construct.			Cost.		
	Miles and Yards.			£	s.	d.
Sheffield	22	... and ...	442	36,235	2	0
Ecclesall Bierlow ...	11	... and ...	825	13,167	0	0
Nether Hallam	4	... and ...	1320	5,247	0	0
Brightside Bierlow ...	5	... and ...	1298	7,088	19	0
Attercliffe-cum-Darnall	2	... and ...	990	2,937	0	0
	Miles 46	... and ...	1355 yards.	64,675	1	0

From the above statement it appears that the township of Sheffield has only about 1½ miles of the old sewers to re-construct. In laying down a system of drainage, the largest sewers have, of course, been first made; and except about 1¼ miles, the whole of the remainder will consist of Nos. 5 and 6. The mains to be laid down in the township will be for the use of Ecclesall Bierlow and Nether Hallam, as well as Sheffield.

To complete the system of public drainage, we have yet to consider the sums required from each township respectively, for side drains, traps, and street grates.

The township of Sheffield had, three years since, for 10 miles of sewers, about 1000 side drains, and this number seemed adequate to the extent of the surface drainage. The average length of these is about five yards each; and as about one-third in length of the township was then sewered, we obtain the following results :—To replace 1000 drains with earthenware pipes, at 7s. per yard, including labour, £1,750; laying down 2000 additional drains at the same price, £3,500; for 3000 traps, at 6s. each, £900; and for 2000 grates, at 23s. each, £2,300; making £8,450 to be added to the estimate already given for the sewers. By the same mode of calculation, we find that the sum of £4,390 would be required from Ecclesall Bierlow; £1814 from Nether Hallam; £2,195 from Brightside Bierlow; and £960 from Attercliffe-cum-Darnall; making a total of £17,809.

The completion of an efficient system of public drainage for the whole of the densely populated part of the borough would therefore cost £82,484.

In considering the water supply, we found it necessary to provide for a great increase of population, because the whole of the permanent machinery must be commensurate with an increased distribution. In the system for again collecting the whole into drains, and removing it from the town, the same principle has also been considered in the sewers already constructed, and in the estimates; but having done this, it is not necessary to estimate the small sewers which may have to be constructed at a future time in streets not yet formed. We have, therefore, confined ourselves to the size and population of the town at present, but have provided in the mains for further extension.

This part of our report would be incomplete if we were to omit the probable cost of house, court, and other private drainage. We have already expressed our opinion that the entire drainage of the town should be constructed and managed by the public authorities; but there are obvious reasons why it would be inequitable that the first cost should be borne by the public.

The drains from houses would vary considerably in length and size; those from manufactories, engines, and warehouses would be additional to the drains from any houses on the premises; the cost of drains from stables, breweries, slaughter-houses, and other places, not houses, where animal and vegetable refuse is produced; and also those from works in which peculiar processes are carried on, causing obnoxious fluids, would, when compared with that necessary for places of equal size and value, from whence no such offensive matters would require removing, make it evident that no method of rating property, generally, for such purposes, could be fairly or equitably adopted.

We recommend, therefore, that the cost of all drainage into the sewers from houses and other buildings should be charged upon the owners of property, and shall hereafter consider the best mode of repayment for these and other sanatory improvements, by the execution of which the value of property will be increased.

As we do not think the private drains should be constructed out of the public rates, it will be unnecessary to divide them into townships for the purposes of calculation. In the year 1841 there were 25,976 houses in the borough, the number is now increased, but the whole can never be drained into the public sewers;—we think, however, that 20,000 would, for our present purpose, be a sufficiently near approximation. From our inspection of the town we are of opinion that about 10 yards of earthenware pipes would be the average for each,—at 5s. per yard for pipes fixing and reinstatement of pavements, this would give £50,000, to this must be added 20,000 traps at 4s. each, and the same number of receiving grates at 1s., making a total sum of £55,000. The manufactories and workshops are, as nearly as we can ascertain, in the proportion of one in 20 to the houses, and would require, on the average, twice the length of pipes and openings each, so that the cost of drains would be one-tenth the above, or £5,500. Total for house, court, and other private drainage, £60,500.

Having obtained an abundant supply of water, and a system of efficient drainage, the rivers passing through the town will be no longer defiled with the refuse of the population, and the discharge from the sewers;—the stagnant fever-producing pools and ponds, which we have described in the first part of our Report, will be rendered dry and harmless;—the surface channels, or iron plates, laid every where across the public footpaths to the carriage way will be abolished;—the dust and mire which now so frequently render the streets a nuisance will be prevented, or removed, by constant washing; and the whole of the excrementitious and other debris of every description carried away from the town, as fast as it is produced;—before fermentation has had time to liberate the pent-up gases, which once set free, convey, like demons, into our dwellings, disease, and misery, and death.

We are strongly of opinion that bricks, tiles, and pipes, for the drainage of towns, are as much entitled to exemption from excise duty as bricks and tiles for the drainage of agricultural land.

STATE OF THE PAVEMENTS OF STREETS, COURTS, &c.

We believe that the pavements of the public highways in Sheffield have obtained a high character as compared with those of many other large towns. This arises partly from the facility with which materials can be obtained, and partly from a system of constant attention and repairs.

On all sides of the town are beds of stone suitable for either flags, kerbstones, or square paving stones, and the river beds and alluvial deposits of the valleys furnish a large quantity of boulders for paving roads of secondary importance. The square stones are from a hard brown quartoze rock of the lower, or gannister coal series, lying within three miles of the town. This stone will not last, in one of our greatest thoroughfares, more than 10 years, and during that time will require frequent repairs. The stones are nine inches deep when laid down, and not more than four inches when finally taken up, therefore the abrasion is equal to half an inch per annum. Upon a road 36 feet wide this would produce every year one cubic yard of sand for every six yards in length, in addition to all extraneous solid matters deposited on the surface. Under a system of complete drainage the whole would have to be carried down the gully-holes into the sewers; this affords a further proof of the necessity for street cleansing; and a much greater supply of water to carry it away; —of the danger in using traps with no water except the showers which fall on the streets; and also of the desirability of a more durable material for a few, at least, of the principal thoroughfares. Several attempts have been made to obtain a better material, and one that will produce less detritus, but hitherto without success.

In a paper on "Modern Carriageways," read by Mr. Lee in the year 1843, before the Philosophical Society, and published at their request, the economical and sanatory view of this part of our subject is fully considered. Further experience has shown the correctness of the statements then made, and therefore we shall make one or two short quotations.

In speaking of the Welsh whinstone used for paving in Liverpool and Manchester, the writer says (p. 15):—"Excepting Guernsey granite, whinstone is the most durable material known. I do not hesitate to say, that it would require *ten years* in one of our greatest Sheffield thoroughfares, to wear away one-fourth of an inch, and for the sake of economy, I hope to see them extensively laid down here when the Sheffield and Manchester Railway shall be completed. and at a cost not exceeding 8s. 6d. per yard." This would require in any year 120 yards in length of a road 36 feet wide for the production of a cubic yard of detritus, which would be so finely comminuted as to remain suspended in a comparatively small stream of water.

Though intimately connected with the economy and durability of roads, the sanatory importance of reducing the dust and mire to the lowest possible quantity, has perhaps not been sufficiently considered.

Boulder pitching is liable to the same objection as the present square stones, and to a greater degree, because there are much wider spaces between the stones,—they are also imbedded in, and covered with ashes, which are blown about, or carried down into the sewers in large quantities.

The pamphlet already quoted, after stating, among the objections of these roads, "that the ashes or sand is soon washed away from the joints of the stones," concludes, (p. 13), "For these reasons, boulder pitching in large towns should be confined to streets where the traffic is inconsiderable; to places where there are few sale shops or buildings of the more respectable class; and to roads where economy is an object of the first importance."

It would be superfluous in this Report to dwell on the the nuisance, as such, of Macadamized roads. Every member of the Council, and almost every inhabitant of the town, knows it by experience. Happily they have now almost disappeared from the densely populated part of the borough. Mr. Lee in his pamphlet, after considering the nuisance of these roads in connection with the comparatively enormous expense of maintaining them in good order, concludes, (p. 10), that "Roads Macadamized, or formed with broken stone, ought to be banished from the precincts of every market town in the kingdom." In this opinion we fully concur, and are convinced that they must be a serious impediment to any system of street cleansing by the agency of water, and also to the efficient working of the public sewerage.

The private streets and lanes in the town are not numerous, but the surface of many of them is entirely an accumulation of ashes, washings from houses, drainage from stables and cowhouses, and excrementitious matters heaped upon an absorbent soil. In several instances the houses have been built upon the site of an old brick-yard, and the road has been raised up with rubbish from the level of the cellars without proper drainage. In all these places, and their immediate neighbourhoods, we found that the epidemic typhus fever had committed extensive ravages. In Sylvester-lane, Leicester-street, the lane between Solly-street and Upper Edward-street, Carr-lane, Woodhouse-lane, Ellis-street, and others, the filthy state of the surface has caused the destruction of many lives within the last nine months.

The result of our examination of the court yards is only a little more favourable. Not more than one-fourth of all the courts in the town are thoroughly paved. In some there is a narrow flagged footpath in front of the houses, but in nearly half nothing more than a slab laid down in the front of each door, and in many not even that. A sense of decency, however, and the privies (which are considered in another part of this report) prevent accumulations of excrementitious matters on the surface from being frequent; though we found instances of this kind during our inspection. The general character of the surface is an absorbent stratum of ashes laid on the soil, receiving the fluids from decayed animal and vegetable substances, which frequently find their way into the cellars of the houses and into the wells and cisterns from whence the inhabitants draw their supply of water. We have frequently seen excavations in such courts, where the soil for many feet deep was turned black and emitted a disagreeable odour.

It has been already stated that a road surface producing mire and dirt, will be a great obstacle to effectual cleansing and drainage; we beg to add, further, that the dust which arises from Macadamized roads will, if inhaled in sufficient quantities, produce disease of the respiratory organs, and that it is highly injurious to articles of food and clothing, whether in houses or exposed for sale. Dust and mire also prevent habits of cleanliness; we never met with a dirty house in a well-paved, clean, court yard. Mire prevents the escape of rain from the surface, and therefore assists the process by which other mire is produced. The Macadamized roads and unpaved lanes and courts absorb moisture impregnated with refuse, and give out by evaporation noxious effluvia, which cause an unhealthy state of the atmosphere, producing or accelerating disease and death.

We recommend, therefore, that for the principal streets, where the greatest amount of detritus is produced, a better quality of paving stones be obtained; that boulder pitching be only used under the restrictions we have already named; that the Macadamized roads be replaced as soon as possible by pavements; that private roads shall be paved and flagged by the public authorities, at the expense of the owners of adjoining property, who shall repay the cost of such work in the manner recommended in another part of this report; and that such roads after the first expense shall be repaired out of the public funds; and lastly that all court yards shall be either paved, or laid down with gas concrete, or other impervious substance, and flagged by, or under the control of the public authorities, to ensure the proper execution of the work, and that the repayment of the cost whenever required by the owners shall be arranged in the manner hereinafter described.

By these means the insoluble refuse of the town, which is the most difficult to remove completely by the agency of water, will be reduced as much as possible in quantity; and, being highly pulverised, will remain in mechanical suspension with a less powerful stream. We have calculated that the mud, mire, sand, ashes, excretions, and all other solid debris of the town at present requiring removal, from the want of better sanatory regulations, exceeds in each year 250,000 tons.

In this part of our enquiries we have not attempted to estimate the cost of works. The reparation of the highways is a department of the public service requiring constant attention, and funds drawn from the rate-payers at stated periods, in sums varying in their amount. We are bound, however, to say that if the sewers be constructed from a separate fund, the paving rates will be less burdensome, and that a rate of sixpence in the pound would be sufficient for the public highways of the borough. The expense of paving the private roads and courts will fall upon the owners of property, and therefore need not be taken into account here, and if some of the occupiers should be called upon to reimburse their landlords by a slight increase of rent, we assert most confidently, as the result of a careful examination and consideration, that they will gain ten-fold by the change, in having more clean dwellings, in increased health, in prolonged existence, and in greater physical energy and power to provide for themselves and families the necessaries, comforts, and luxuries of life.

CLEANSING OF STREETS AND COURTS.

With an efficient system of drainage, and an abundant supply of water under pressure, there can be no question that the most *economical* method of cleansing the streets would be, to wash away, by hose and jet pipe, all the lighter substances into the sewer; which would, from its deeper current, always carry away anything that would float off from the surface of the street. Any stones, or other large and heavy bodies, would of course, be collected and removed by carts. If one man could remove by the jet only as much street soil as he could scrape together in the same time, the water in the sewer being a self-acting agent would carry it without expense, and thus save the cost of horse and cart. It would also be a more *effectual* mode, because the tools used for scraping pass over the little inequalities of the surface, leaving a portion of the refuse behind, but a jet of water would make the street perfectly clean. Most persons have seen how much more effectually the surface of the streets are cleansed by a heavy thunder storm than by all the labour of the scavenger.

The flushing of sewers was adopted in the Holborn and Finsbury districts in consequence of a successful experiment in cleansing a reservoir belonging to the West Middlesex Water Company; but the cleansing of the surface of roads by streams of water has been scarcely attempted, on an extensive scale. On the Park Road, which was entirely Macadamized until recently, this mode of cleansing has been used for about 15 years. The road had a very heavy traffic. Above 2000 tons of materials were annually ground into dust and mire, upon a length of about 1¾ miles. A small pond was made in a field on the upper side of the road near the Deep Pits, and in the winter season, when the road was dirty, and the channels filled with mire, every favourable opportunity was taken to wash and cleanse the surface, by letting off the dam, and employing men with rakes to stir up and mix the mud with the water. Seven or eight men, employed in this manner, could wash away more refuse from the road, in half a day, than as many horses and carts, with men to attend them, could have removed in three days.

The inhabitants are at present liable to cleanse the footpaths in front of their houses, there can be no question that it is very irregularly, and very inefficiently done. We recommend that there be no exception, but that the whole of the public highways be cleansed by the public authorities.

No system of street cleansing, however effective, will materially raise the health of the town, so long as a great number of the inhabitants reside in courts where the unpaved surface is continually absorbing the vegetable and animal refuse thrown from the houses, and filling the air with poisonous exhalations. The evil is one of a public nature. The bad effects are not confined to the inhabitants of such courts, and are very rarely experienced by the owners of property; we have met with many courts where the highest rents were realized from the most filthy and unhealthy dwellings. The owners, while they can obtain their rents, will not, voluntarily, incur the expense of improvements, and the occupiers are too deeply sunk in the misery consequent upon such a state of things, to attempt, of themselves, any remedy. The filthy courts of a densely populated town like Sheffield, will certainly affect the general health of the place, and it is therefore right to adopt measures for the regular and proper removal of such filth by the public authorities. Court yards, as well as streets, should, wherever it is practicable, be cleansed and washed by hose and jet pipe, from the nearest plug; and in smaller courts, or where the distance is too great, by buckets;—and the coal ashes removed from the proper receptacles in carts. All the refuse, soil, dust, &c. from streets, courts, and houses, should be vested in the Council.

There are three depôts in the town for the reception of the street refuse;—Norris-field, South Arundel-street, and Wicker-lane. They are all in low, ill-drained, unhealthy neighbourhoods. Many complaints were made to us during our inspection of the town, of the injurious effects produced by these places. Behind one of them are the premises of a respectable cowkeeper, who informed us that his cows had been injured by eating turnips stored in a building adjoining the depôt. On the opposite side of the street, from the second, we discovered that the drainage from the refuse found its way extensively into the cellars of the houses. At the third were many complaints of insects in summer, and of vermin during the whole year. One woman assured us that a loaf of bread, left for an hour in hot weather upon the table, was rendered black by the filth from the feet of flies, and stank. Several persons in the same neighbourhood told us that the paper hangings of their rooms would require renewing every year, from the same cause, if their houses were to be kept decent.

There were also general complaints of unpleasant and offensive smells in hot weather.

We are of opinion that no depôt for the refuse removed by carts should be allowed to remain within the town, but that such refuse, if any, as may have a commercial value, for agricultural purposes, should be deposited in places provided at a distance, on the roads leading to the districts where it is likely to be used. If it should cost the public more for leading away from the town, the farmer would have a less distance to cart it, and would consequently pay a proportionately higher price.

The following table shews the cost of the public street cleansing, in Sheffield, from the year 1838 to the year 1846, inclusive :—

Year.	Gross cost.			Receipts for soil.			Nett cost.		
June 1st to May 31.	£	s.	d.	£	s.	d.	£	s.	d.
1838 to 1839	868	17	0	456	18	2	411	18	10
1839 to 1840	847	5	8	488	11	8	358	14	0
1840 to 1841	833	0	7	439	13	6	391	7	1
1841 to 1842	908	1	7	436	16	1	471	5	6
1842 to 1843	847	19	0	370	17	1	477	1	11
1843 to 1844	708	18	6	426	3	6	282	15	0
1844 to 1845	910	8	6	445	15	0	464	13	6
1845 to 1846	722	18	6	283	4	6	439	14	0
Average	£830	18	8	£418	9	11¼	£412	8	8¾

The expense of cleansing the streets in the township *only*, of Manchester, was, in the year 1842, the sum of £5,000 per annum ; and it is stated in evidence that the town was not efficiently cleansed. The population of the entire borough of Manchester, in 1841, was 235,507—rather more than double that of the borough of Sheffield, at the same period ;

what, then, will be thought of the public street cleansing here, when the nett average expenditure for the last eight years has only been £412 8s. 8$\frac{3}{4}$d.?

We are fully aware that the funds of the Improvement Commissioners are limited by their Act of Parliament; and our object in these remarks is not to cast censure on them, but to shew the necessity of more enlarged views of local management, and of more comprehensive and efficient legal powers; to set before the Council the intimate connection which these various departments of the public service have with each other; and the advantages which would result from a combination of the whole under one controuling authority.

It is difficult, in the present state of our experience, to estimate the expense of an efficient system of surface cleansing by water. The following is an approximation upon a very liberal scale. The water is supposed to be already supplied at the public cost:—

Annual interest upon first cost of hose and pipes, three horses and carts, &c.. .	£ 30	0	0
Fifteen men, wages	750	0	0
Three horses, provender	150	0	0
Wear and tear and depreciation of hose, &c.	250	0	0
Management and incidentals, say......	120	0	0
	£1,300	0	0

This would be about an average of *one shilling* per annum for each house in the borough.

The principal streets of the town are tolerably well cleansed, but the inferior streets and lanes are seldom visited by the scavenger. The private roads and places where we found disease raging with the greatest virulence are never cleansed at all; and the common reply of the manager of the scavenging to any application respecting the cleansing of a Macadamized road is, that the dirt will not pay for removing.

We conclude this part of our report in the words of Mr. Chadwick (Sanatory Report of the Poor Law Commissioners, page 54):—"The value of a process of street cleansing is proportioned to the rapidity with which it is performed; but at present it is usually delayed until the sun or the air has done a considerable portion of the work by the evaporation of the moisture; commonly, however, to the deterioration of the air of the town and the health, and also to the deterioration of the value of the refuse."

APPLICATION OF THE REFUSE TO AGRICULTURAL PURPOSES.

To the chemical part of this question Mr. Haywood has given his attention, and has ascertained the marketable value of the phosphates and other valuable substances contained in the refuse of the town. The sewer-water is, in principle and origin, public property. It is admitted by all authorities to have a great intrinsic value. Many scientific men have stated it to be worth from 10s. to 20s. for each individual of the population, or from £65,000 to £130,000 per annum for the borough of Sheffield. All contribute to produce this valuable commodity, but no one has attempted to turn it to a profitable account. It has been allowed to produce evils, in the shape of disease and death, which have probably cost the community in poor-rates, loss of work, &c., as great an amount as its estimated value. We now address ourselves to the best engineering and mechanical method of applying it to agricultural purposes.

The subject is an important, but somewhat difficult one;—important, because of the value of the refuse, and the great interests connected with its removal in the best manner;—and difficult, because we are at present destitute of all practical experience as to the result of its application on a large scale.

In theory, we are able easily to reduce the matter to mechanical calculation; but in practice the entire drainage of no town, however small, has yet been applied to agricultural purposes.

We have already shewn that the cleansing of the town, and the removal of the refuse by the agency of water, will be more effective and more economical than by any other means; and that with a greatly increased supply of water, and its constant application to this purpose, putrefaction of animal and vegetable refuse would be prevented. The same reasoning applies to the application of the refuse. It would be conveyed to the agricultural districts more cheaply through pipes in solution and suspension, than by carts; it would be distributed more economically and quickly by hose and jet pipe than by hand labour, and in a fluid state would diffuse its fertilizing properties immediately through the soil, and bring them in contact with the roots of plants without the evolution or escape of those gases, which, while they contain a great portion of its agricultural value, are at the same time, if allowed to mix with the atmosphere, offensive and injurious.

On a subject of ordinary interest it would not be necessary in this report to quote from published documents, but only to refer the Council to the important evidence given on this subject before the Health of Towns' Commission. We feel constrained, however, to give an epitome of the only plan yet laid down for the entire application of the refuse of a town by the agency of water. We allude to that of James Smith, Esq., of Deanstone, (one of Her Majesty's Commissioners) contained in the Appendix of the Commissioners Second Report, Part 2, p. 325.

Mr. Smith, found, by experiment, that with 120 feet pressure, and 2½ inch hose, having a discharging orifice or nozzle of 1 inch diameter, he could from one point distribute water over an area of 2 statute acres, but, to be safe, he says, one; and that a jet of that size would deliver in three applications the requisite quantity. The hose to be worked by persons belonging to the sewer-water establishment, at such times as might be agreed upon between the distributors and the farmer.

In order to ascertain the quantity necessary, per acre, he obtained the opinions of Mr. West, of Leeds, and of Mr. Phillips, that 5 cwts. of the fertilizing matter in sewer water is equal to 2½ cwts. of the best guano, and that the quantity of sewer water necessary to furnish 5 cwts. of the fertilizing matter is 17,920 gallons, which would induce a very rich condition of the soil.

Mr. Smith then gives estimates of the cost of works and annual expense of distribution over an area of 4 square miles, equal to 2,560 acres, and deduces the following important conclusions, as to the comparative cost of applying, to an acre of land, equal quantities of fertilizing matter in different forms :—

	£	s.	d.
Cost of manuring one acre with sewer water	0	12	9
,, ,, guano, 2½ cwts, at 8s.	1	0	0
,, ,, farm yard manure, 15 tons, at 4s.	3	0	0
Sewer water is cheaper than guano	0	7	3
,, ,, farm yard manure	2	7	3
,, ,, the average of the two	1	7	3

He afterwards gives the cost of applying double quantities of each, in which the advantages of sewer water are consideraby greater.

Mr. Smith then states :—"I have ascertained that the quantity of sewer-water due to a town of 50,000 inhabitants amounts to about 1,190,080,946 gallons per annum, which quantity will yield an annual application of 17,920 gallons per acre, to an extent of 66,410 acres."

"Taking the average cost of guano and farm yard manure, as shewn in the first and lowest estimate, at £2 per acre, and deducting 12s. 9d., the cost of the application of sewer water, there will appear a saving due to the sewer water of £1 7s. 3d. per acre; allowing one-half thereof to go to the farmer, there will remain a free income due to the sewer water of £45,241, which is nearly £1 per head of the population."

We do not vouch for the accuracy of the comparative value of sewer water and guano, but for argument, will suppose it correct. We shall hereafter shew that the cost of application would be even less than Mr. Smith has stated, but we are bound to point out an inaccuracy in the conclusions, which practically goes to the root of the matter. Mr. Smith's estimates are made for the manuring of an area of 2,560 acres, with the refuse of a population of only 1,927 persons; but his conclusions are upon the same scale of profit for a population of 50,000 and an area of 66,410 acres. He assumes that it would not only be practicable but equally cheap, and as certainly successful, in all cases, to remove the whole of the debris of the town, and apply it to agricultural purposes, through the agency of water, without reference to the amount of the population, or the physical geography of the surrounding district. The relative proportion between his estimate and the deduction therefrom is as 1 to 26.

The income which would have resulted to this borough had the assumption been correct, would have been on Mr Smith's data £117,626 12s. 0d. per annum. We are sorry, therefore, that after the most careful investigation of the whole subject, we are brought to a different conclusion, not so much as to the possibility of securing the valuable portion of the refuse, but as to the practicability of applying the whole to agricultural purposes, through the agency of water.

The daily supply of water which we have provided for all purposes is 6,350,934 gallons, equal to 2,318,090,866 gallons per annum. To this we must add the quantity of rain which will fall yearly upon that part of the borough drained by the sewers, because they must receive and carry it away. Now in estimating the quantity of water which could be brought to the town, we found it necessary to take the driest year; but in constructing a system of drainage it will be evident that we ought to take the maximum fall, because the sewers must be capable of receiving, and conducting it away. We have taken, however, for our present purpose, only the net quantity of 15 inches, as in the case of the Redmires water supply, and we obtain a quantity of 959,805,900 gallons;

making, with that brought for the supply of the town, a total of 3,277,896,766 gallons per annum passing through the sewers of the town. Taking the quantity given by Mr. Smith at 17,920 gallons per acre, we find that the sewer water of Sheffield would be sufficient to fertilize 182,918 acres of land, equal to a square having its side nearly 17 miles in length.

If it be thought that this area is exaggerated beyond due bounds, by the great supply of water brought to the town, we reply on Mr. Smith's own data, as 50,000 inhabitants is to 66,410 acres, so is 130,000, about the present population of the borough, to 172,666 acres, or to a square of very nearly 16½ miles. We may observe in passing, how nearly, by this analytical process, the quantity of water we have considered necessary for the town, approaches that laid down by Mr. Smith. To proceed,—it not unfrequently happens that three-fourths of an inch of rain falls during the 24 hours; this would give upon the area occupied by the sewers, 47,990,295 gallons, which, added to the day's supply from the reservoirs, would make 54,341,229 gallons. One-fourth of an inch, with the same addition, would make 22,347,699 gallons, equal to a reservoir with 4 acres of surface, and 20 feet average depth, flowing from the town into the tanks within 24 hours; when, in all probaility, the agricultural land in the district would be so saturated with moisture that the sewer water could not be beneficially applied.

The impracticability of even conveying the entire drainage into tanks will be at once seen when we state, that three-fourths of an inch rain, and one day's water supply, would require a circular culvert 11 feet in diameter, running choke full for 12 hours to remove it.

The last objection which presents itself to our minds is, that the great length of piping would not only very much increase the expense of distribution, but that unless very large pipes were used, the friction would so diminish the velocity that application by hose and jet pipes would become impracticable. A pipe of 16 inches diameter and one mile long, with a pressure of 173 feet, would give a velocity of $9\frac{4}{10}$ feet second, and would discharge $13\frac{1}{6}$ cubic feet per second, while a pipe of the same diameter, with an equal pressure, 17 miles in length, without any deduction for curves or bends in its course, would only give about $2\frac{1}{4}$ feet per second velocity, and discharge about $3\frac{1}{6}$ cubic feet per second.

We now come to consider the extent to which it would be practicable to apply the refuse in this manner in our own neighbourhood, without great difficulty, and scarcely need repeat that the surface of the district is of the very uneven character common to the carboniferous system. The soil of the vallies of the Don and the Rother is an alluvial deposit, chiefly sand and gravel, frequently passing on the margins into a strong yellow clay. This description would be generally applicable to 3000 acres, at an elevation of 60 feet above the beds of those rivers north and west of Rotherham. The higher ground consists of various shales, clays and sandstones.

		£	s.	d.
With a pressure of 60 feet above the intended depôt at Salmon Pastures, about 3000 acres might be fertilized between Sheffield and Rotherham	20s. =	3000	0	0
The same head continued beyond Rotherham, about 2000 acres	20s. =	2000	0	0
With a pressure of 150 feet, say 3000 acres additional...	20s. =	3000	0	0
At 300 feet a further quantity of probably 5000 acres	20s. =	5000	0	0
		£13,000	0	0

We have taken the rate at which it is to be charged, the same as Mr. Smith, because it seems a very reasonable sum, and holds out to the farmer a sufficient advantage to induce him to adopt the system.

The cost of the machinery and works, and the subsequent annual expenditure next claim our attention, in order that we may ascertain the money advantage which the town may derive from this mode of application.

Estimate of the probable cost of engines, tanks, pipes, &c. for applying sewer water over 13,000 acres of land in the neighbourhood of Sheffield:—

	£	s.	d.
Land	2,400	0	0
Receiving Tanks	3,000	0	0
30-Horse power pumping engine, engine-house, chimney, stand pipe, &c.	2,500	0	0
30-Horse power pumping engine, &c. &c.	2,500	0	0
10 miles of 16 inch metal pipe and laying, £1 10s. 0d. per yard	26,400	0	0
20 miles of fire clay service pipes	3,000	0	0
Hose with screw joints	300	0	0
Plug cocks, &c.	450	0	0
	£40,550	0	0

	£	s.	d.
Brought forward	40,550	0	0
Contingencies 10 per cent.	4,055	0	0
Outlay for 13,000 acres	£44,605	0	0

For one acre £3 8s. 7½d.

Estimate of the probable annual expense of distributing 17,920 gallons of sewer water per acre, over 13,000 acres of land in the neighbourhood of Sheffield :—

	£	s.	d.
Raising 232,960,000 gallons of sewer water, an average height of 173 feet, at 1½d. per thousand gallons ...	1,456	0	0
Annual wear and renewal of hose	450	0	0
Management and wages of the men employed in distributing	1,740	0	0
Rates and Taxes	75	0	0
Interest on capital sunk £44,605, at 4 per cent. ...	1,784	4	0
Allow for repairs and sinking fund, 2 per cent. on the first outlay, ...	892	2	0
Or 9s. 10$\frac{1}{10}$ per acre.	£6397	6	0

	£	s.	d.
Total annual income from 13,000 acres	13,000	0	0
Total expenditure	6,397	6	0
Clear annual profit to the Borough ...	£6,602	14	0

We will now briefly review the conclusions at which we have arrived, and then, state what we recommend, under the circumstances, as the best plan to be adopted, for turning the refuse of the town to profitable account :—

1. That it would require an area of 172,666 acres, or not less than 16½ miles in length, and of the same width, to receive the whole of the sewer water of Sheffield.
2. That after heavy rain, when the agricultural land would be saturated, the drainage water would be so increased in quantity as to become utterly unmanageable in tanks, or any system of distributing pipes.
3. That at the same time it could not be marshalled in any main culvert which it would be practicable to construct from the town to the depôt, without an enormous expense.
4. That in a main pipe 17 miles long, with many turns and bends along its course, the velocity of the stream, and the discharge in a given time, would be so diminished, that unless the whole of the works were of a very expensive character, they would not be efficient.
5. That 13,000 acres of land may be fertilized with the drainage of Sheffield, through the agency of water, but that beyond this, we cannot at present calculate : and
6. That even this very limited application would produce a clear annual profit to the Borough of £6,602 14s. 0d.

The progress of public opinion is generally more slow in the agricultural than in the manufacturing districts. But within the last two years, a great impulse has been given to agriculture by the dissemination of chemical knowledge. We are convinced that the time will shortly come when the value of town refuse will be fully appreciated, and its application in a fluid state, carried to the utmost extent, consistent with economy and profit.

In the meantime, we recommend that as soon as the Council shall be invested with legal powers for sanatory purposes, the main culverts which we have described under the head "Drainage," be constructed to collect all the ordinary flow of the sewerage to one point; and that valves be made therein, so as to open, under a certain pressure of the stream, and throw off the flood-water into the river. No injurious effect need be apprehended from this, because such valves would be below the densely populated part of the town, and when the streams in the mains were so swollen as to act upon the valves, the sewage water would be in a diluted state, and there would generally, from the same cause, be a sufficient quantity of water in the river to carry it entirely away. At the point where these main drains all converge, a sufficient number of tanks should be constructed to receive the ordinary drainage, and allow time for the chemical precipitation of all the valuable ingredients in the manner pointed out by Mr. Haywood, in his part of the report, and for the settlement of the earthy and other insoluble matters. The water should then be lifted out of the tanks by a pumping engine, and returned to the river deprived of every thing which would produce injurious emanations. The phosphates and other valuable chemical compounds would thus be secured in a solid portable state, of high marketable value, while the sedimentary and insoluble portion of the refuse could be taken out of the tanks by a dredging apparatus, worked by the engine, and dispatched either by road or railway; still retaining a sufficient quantity of fertilizing matter to produce an income of several thousand pounds per annum The whole cost of the land, tanks, engine, and other apparatus for this separation of the manure, would probably not amount to £10,000; the annual working expenses and maintenance of the establishment £2,600, and the annual income £30,000.

Additional engines, and distribution by pipes could be afterwards introduced, and extended with the demand. The land for the depot, and the tanks would already exist, as a sufficient foundation for the whole system.

NEW THOROUGHFARES, WIDTH OF STREETS, &C.

That part of our report which gives the result of our inspection of the streets, courts, and houses, in the borough, will convince the Council that behind many of our public streets, which make a very fair outside shew, there exist, unknown to the thousands of daily passengers, close, unhealthy courts and dwellings, inaccessible to a breath of pure air, and in many instances almost to light;—containing abundant sources of disease, and inhabited by multitudes of human beings, without either energy or ability to better their condition; pining away a miserable existence, and falling victims to a premature death. Many of these are in the older parts of the borough, where new thoroughfares have become desirable, in consequence of the increased size of the town, and there can be no doubt that the making of such thoroughfares would not only facilitate business, by shortening the distance from one part of the town to another, but would very much improve the public health, by removing causes of disease and promoting ventilation. We have prepared plans of several such improvements and present them to the Committee.*

No. 1. A new street leading directly from Westbar to the lower part of Waingate; this would intersect Water-lane and Castle-green, removing a great quantity of inferior dwellings, and would become immediately one of the most important thoroughfares in the town.

No. 2. From the bottom of Garden-street and Broad-lane to the top of Furnace-hill, intersecting Hollis-croft, White-croft, and Pea-croft; as a thoroughfare this would be important, though not equal to the other; but in a sanatory point of view the benefit would be even greater.

No. 3. A new street leading from the bottom of Bower-spring to the Iron Bridge.

No. 4. A new street from the Old Haymarket into Pond-street.

No. 5. A new street from the bottom of Edward-street into Allen-street, near Smithfield.

No. 6. A new street from Cross Burgess-street to Wellington-street.

No. 7. A new street from Fargate, below the corner of Norfolk-row, intersecting Orchard-street and Smith-street, to the bottom of West-street.

No. 8. A new street from High-street, above George-street, into Hartshead.

No. 9. The opening of Watson's Walk into the Market-place.

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* These and the other plans accompanying Mr. Lee's Report have not been published by the Health Committee, because the additional expense would have contracted the circulation of the Report.

No. 10. A new street from Queen-street, between the Chapel and the Highway Offices to Westbar, intersecting New-street and Scargill-croft, and removing many dens of iniquity and filth from this most depraved neighbourhood.

It would have been easy to have produced many other instances of improved thoroughfares from the opening of which great public advantage would arise.

In many of these the money value of the land and buildings is at present very low;—in some the property is of the worst description; but if streets were opened and new buildings erected, with proper regard to water, drainage, ventilation, &c., and stipulations as to the size, elevation, and character of the buildings suitable to that part of the town in which they were situated, there can be no doubt that the enhanced value of the property would of itself amply repay the enterprise of private speculation. In three or four at least of the above, land which is not now worth more than 5s. per yard, would immediately become worth several pounds, and it is very probable that if they were executed by the public authorities a fund would be produced towards effecting other improvements, where the benefit to the public would be equally great; but the value of the property would not be increased sufficiently to repay the expenditure.

The most regularly built part of the town, and the least occupied by confined courts, is that bounded on the west by Norfolk-street, Union-street, and Porter-street, and on the east by Arundel-street. With the exception of the suburbs, we have no hesitation in saying, that this is the most healthy part of the town. It is not so well drained, artificially, as some parts of the town; the pavements are not better, or the inclination of the surface greater; but there is a greater quantity of free air in circulation, and the buildings are not generally so closely packed together.

Probably few towns of equal size and importance have such narrow streets as Sheffield. Excepting South-street, Broad-lane, Shales-moor, the Old Haymarket, and the Wicker, we are not aware of any street more than 40 feet wide. That seems to have been considered by those who have laid out most of the streets within the last fifty years as the maximum width under any circumstances.

The Parish Church is generally the nucleus and centre of a town, and the houses have been built around it in an irregular manner, forming narrow, circuitous streets and lanes; but when lines of road, radiating from it to other towns, have been constructed through land of little comparative value, they have generally been made more commodious; and in recent times, when new streets have been laid out, transverse between such high roads, as the place increased in population and importance, they have become the most healthy, as well as the most elegant parts of the town. This is unfortunately not the case with Sheffield; the streets are broken up into zigzags and fragments, and exhibit all possible evidences of narrow and contracted notions. We recommend that in future no road be set out until the level has been fixed in a satisfactory manner; that 30 feet shall be the minimum width of every lane, and that new streets shall not in any case be less than 45 feet; or, if a first-class street, from 60 to 75 feet in width. The plan and section of every new road, intended to be set out by any private individual, ought to be subject to the approval of the Corporation, or their officer; otherwise the evil will still be perpetrated; and when the road becomes a public highway, with buildings erected upon it, no effectual remedy can be applied. This has been the case very frequently in the town, instances of which will occur to the memories of most of the Council.

If wide streets are of great advantage in promoting free currents of air through the town, not less so are open spaces for light, air, and exercise. Such places ought to be provided in the immediate vicinity of all large towns. Those who have opportunity of seeing at pleasure our Botanical Gardens will know the feeling of satisfaction and complacency which pervades their own minds during, and after, each visit, and that the same feeling appears to animate all whom they meet there. This contented, happy state of mind is, perhaps, more conducive to health than is generally imagined; and the industrious artizan ought to have the opportunity of enjoying a similar pleasure. Many of the industrious classes will no doubt shortly be able to enjoy the beauties of the grounds now being laid out by the liberality of the Duke of Norfolk, but a large portion of those living on the opposite side of the town will be unable during the greatest portion of the year to wander so far, either before or after a day's labour. It would be well if another place, therefore, were provided, which need not be expensively laid out, where the working man could resort without expense, or temptation, not only for walking exercise, but also to enjoy such innocent sports as bowls, football, and cricket.

STRUCTURAL ARRANGEMENTS AND VENTILATION OF HOUSES.

In considering the structural arrangements of dwellings, it will not be necessary specially to notice those intended for the higher classes of society; they are generally in more healthy situations than those occupied by the working classes; the rooms are larger, and except in sleeping apartments, the occupants do not spend so large a portion of their time in the same room. We shall confine ourselves, therefore, principally to the habitations of the industrious classes.

Much has been said, and many and various are the plans submitted in the Reports of the Health of Towns Commission, for the improvement of dwellings for the lower classes; but, in our opinion, few, if any, of them would practically answer the expectation of the proposers. The latest, and best plan for this purpose is now being carried into execution on a site near Old St. Pancras Church, London, by the Metropolitan Association for improving the Dwellings of the Industrious Classes.

The design is, to erect one building to contain 100 dwellings, in *flats* of 20 each, and five stories high. All the rooms in each dwelling are on the same level. To communicate with these flats eight staircases are provided, so that one staircase is common to, and one outer door closes in, at least 12 dwellings. Each house is to have a sitting room, 14 feet by 10½; one bed-room, 13 feet by 9½; another 13 feet by 7; and a scullery, 6 feet by 6; a water closet, sinkstone, meat safe, and dust shaft. Very few of the bed-rooms have fireplaces. We give a plan of one of the floors of the building.

The general form of the whole structure is, in our opinion, not good. The projections at each end injuriously affect the greater part of the dwellings by impeding the free passage of light and air.

The arrangement of 12 families to one staircase and outer door, we think highly objectionable, especially in a building erected for improving the condition of the inhabitants. We do not think it wise, or conducive to morality, that 12 families should be shut up, as it were, in one house. The kitchen or scullery is an exceedingly important part of any dwelling with reference to its sanatory condition. What shall we say then to a receptacle for the supply of coal for the family,—a sinkstone, at which washing and cleansing is to be done,—a shaft with lid cover, which is intended to receive all the dust, garbage, and refuse from 12 dwellings,—a meat safe for keeping the family provisions, and a water-closet, not perhaps always in perfect condition; all these, within a space of six feet square.

We think that, capable of improvement as many of them are, the back to back cottages of which we have so many in Sheffield, are preferable to these.

Notwithstanding all the evils we have seen during our inspection of the town, we do not hesitate to say, generally, that the *construction* of the houses occupied by the working classes in Sheffield is better, and the rental more moderate, than in almost any other town in the kingdom. The great amount of sickness, and the high rate of mortality here arises, so far as the dwellings are concerned, more from an inadequate supply of water and inefficient drainage, than from defective structural arrangements. We are not aware that there is a cellar dwelling in the town. With very few exceptions, every married working man occupies a house. Each cottage has an outer door opening into the public street or yard; palpably visible to all who live near, and the occupier knows that the moral conduct of himself and family is under the immediate observation of his neighbours; but no person can have a pretence to enter his door without permission, and, therefore he feels that his house is his castle.

We recommend that cottages should be erected in paralellograms, with no material projections to interfere with the free passage of air along both sides of the blocks; that, as far as practicable, when cottages are erected on plots of land having frontages to two streets, no buildings should be placed, as is too frequently done, at the ends of the open space between the blocks. The owners of adjoining property should be prevented from erecting anything higher than a fence wall, so that there may be a free current of air from one end of the street to the other. It is quite impracticable, and altogether unnecessary, to put a water-closet into every house in Sheffield. The privies, however, *as at present constructed,* must be dispensed with, before the health of the town can be materially improved. One privy, with a latch key, should be provided for every four, or at the most, five cottages; on the top of it a cistern may be fixed, if necessary, and the interior fitted up with the simpler kind of water-closet apparatus, the soil being carried into the street sewer by a drain pipe. Every court yard should be well drained and paved. The only additional requisite for the exterior would be a *covered* dust hole, detached from the privy, for the common use of all the tenants.

All cottages should be provided with an arched cellar, and pipe drain to the sewer, securely trapped. On the ground floor of back to back houses, the living room should be at least 12 feet square and 9 feet high, fitted up with oven, range and boiler, set-pot, and sinkstone, having a tap over it constantly supplied with water, and a loose bell-trapped waste pipe. The chamber over the living room 8½ feet high, to be made private from the staircase leading to the attic 8 feet high. There should be fire-places in, and open flues from the living and sleeping rooms, and *double-sliding* sashes for light and ventilation.

We are satisfied that a cottage fitted up with a fire-place and double-sliding sashes in every room, may be better ventilated and purified than by the use of any artificial means yet discovered. We are glad to confirm our opinion, on this part of the subject, by a quotation from a Report of the Metropolitan Association for Improving the Dwellings of the Industrious Classes, in the buildings already referred to:—" The committee of works have given much time and consideration to the subject of ventilation and warmth. They have carefully examined all the systems and plans that have been suggested for this object, of which they could obtain any information; but they regret to state, that no plan which has come under their consideration, has appeared sufficiently secure from the danger of failure to warrant their adoption of it.

" The science of ventilating buildings with fresh warm air, at a moderate expense, is at present so much in its infancy, that although the directors have delayed the commencement of the works for several months, in the hope of being able to mature some means of accomplishing this object, they have been unable to devise any plan which they have thought it safe to attempt. The result of an experiment that seemed to afford much promise, and for the trial of which a sum of £10 was voted at the request of the gentleman who submitted the plan, confirmed them in their conviction, that the state of knowledge is not yet sufficiently advanced to justify them in attempting to introduce this great, and as they think, essential improvement in their first building."

Arnott's valve introduced into the chimney is said to remove entirely the foul air from a room. We have not seen it in operation, but it is highly recommended.

In larger houses than those occupied by the working classes, a great improvement would be effected if openings were made in the interior walls of all the rooms and passages, sufficiently large to transmit air to all parts of the house. The whole interior would then form one large reservoir of air, and if any deterioration were going on in one room, the equilibrium would be maintained by the free admission of better air from all the other rooms, without the unpleasantness of external drafts.

For similar houses and all others having sufficient room for the purpose, we recommend Austin's Patent Torrent Water Closet apparatus, as the most perfect yet invented. No cistern is required where a constant supply of water is given. As soon as the seat is pressed, a measure begins to fill with water from the tap ;—when the pressure is removed, the water is precipitated down a pipe called the torrent pipe, with considerable force, and effectually removes every vestige of the excreta. It is self-acting; not liable to the disarrangements of the ordinary closets, and we are informed considerably cheaper than those generally used.

The window tax was probably imposed, in its present form, from a desire to make property a source of revenue in proportion to its value, without inflicting a burden upon the humbler classes of society. In the former respect it has been partially successful, in the latter it is almost an utter failure.

In how many thousand instances is it either entirely evaded, or reduced in amount, by the stopping up of windows, which would otherwise remain open; and, yet, such houses produce the same amount of rent to the owner, as when the windows were open. The tenant does not generally think his house less valuable on that account.

There are houses in Sheffield of £12 rental, paying twice as much for window tax as some other houses of £20 rental. Property is, therefore, not taxed in proportion to its value.

In London, Manchester, Liverpool, and other large places, where several poor families reside in one house, the smallest possible number of windows are made, while staircases, passages, and cellars are left to be magazines of deleterious air. Even in this borough, where, as we have already stated, nearly every family occupies a separate dwelling, many respectable artizans, bookkeepers, and others, would have a greater number of windows in their houses, if this tax were not in existence. It offers a premium for the defective and vicious construction of houses, and tends to create and continue, those abodes of filth and disease which disgrace our land. The necessity of ventilation, and the importance of light and air, are not yet sufficiently felt to induce the payment of the tax, even by those who are able. Those who are not able, have to endure all the evil consequences of a deficient supply of those necessaries.

The window tax, therefore, inflicts a great burden upon the humbler classes of society.

The adoption of compulsory measures for the ventilation of houses, is the most difficult part of sanatory reform, on account of the interference with the privacy of domestic life, which the enforcement of any such legislative enactment must involve. Very much must be left to the voluntary exertions of the inhabitants themselves.

The part of wisdom seems to be, to convince them of the necessity of better ventilation and cleanliness; and then, to encourage and stimulate their efforts.

Under this view of the subject, what can we think of a tax which practically excludes the free use of light and air in dwelling houses, impedes ventilation, and is consequently prejudicial to the health of the community.

If a tax of this description, in some form, be necessary and indispensable, it had better be levied as a house tax, upon all dwellings above a certain size or value; and allow the owner to make as many openings for light and air as he may think proper.

Horses will never be so constructed as to be really healthful habitations while the window tax remains.

We recommend the council to use their influence in obtaining the abolition of this tax; or if the amount now realized be necessary to the revenue of the country, in causing a removal of the impost to some article, or description of property, less injurious to the health and comfort of the population.

STRUCTURAL ARRANGEMENTS AND VENTILATION OF WORKSHOPS.

We have already stated that many of our workshops are very close and ill-ventilated. Very often the men only are to blame; they seem to have a great dislike to open windows, and when we (coming out of the free air, and almost suffocated with the closeness of their rooms) remonstrated with them, the general answer was, that they felt no inconvenience from it. Where the fault was, however, in the structural arrangement of the shop, we not only found the men in a state of ill health, but keenly sensible of the injurious effects of breathing a polluted atmosphere.

File-cutting is an operation in which men can be packed very closely, and the bodily exercise required is so little, that they appear to be very susceptible of cold. They not only keep their windows closed, but frequently have screens placed behind them to prevent the little air which finds its way through the crevices of the door from approaching them. This branch of the staple trade of our town employs a great number of men, and of all workshops we ever saw, those occupied by the file-cutters are the worst constructed, and contain the least quantity of breathing room for each individual.

After the first few days of our inspection of manufactories, we began to take the dimensions of these shops, the result of which is, that in 33 shops, there are 378 file-cutters at work, with an average of only 279 cubic feet of breathing room each, without any deduction for the bulk of benches, tools, or their own bodies. In one of these the space per man is 189 feet; in another 171; in two shops only 162; and in one not more than 135 feet. We cannot say that there are more than three really well constructed file-cutting shops in the town. The first is Messrs. Johnson, Cammell, and Co., where the bulk is upwards of 300 cubic feet per man; Messrs. Butchers' 367; and a new shop at the works of Messrs. Saml. Newbould & Co., where the bulk is 540 cubic feet each.

These confined rooms may feel momentarily comfortable to the inmates; but it is quite certain that persons spending a great portion of their time in such a close contaminated atmosphere will be very liable to catarrhs and coughs, with all the active and chronic diseases of which these are the forerunners. The remote effects are not appreciated by the men, but they feel that which is more immediate, and state that the rooms are often very uncomfortable during hot weather; and that in the long winter evenings, when candles have been burning for some time, the place becomes very oppressive, and produces a sensation of faintness, giddiness, and complete exhaustion. In these shops we became familiar with a peculiar odour, arising from perspiration,—emanations from the men's apparel, and respiration, diffused through the stagnant atmosphere, and unmixed with any of the fumes or dust generally arising from manufacturing processes.

In great many of the cutlers and other workshops we found similar structural defects, and want of arrangement for ventilation; but in none to such an extent as in those of the file-cutters.

Workshops should be so arranged that no man should have less than 500 *cubic feet of room to breathe in.*

In many of these, and also in many workshops belonging to other trades, the air deteriorated either by respiration, or the particular process carried on, might be almost entirely removed, at a trifling expense, by a small wooden shaft, carried up through the ceiling and roof, with a square dome on the ridge of the building, fitted with flapboards, which could be opened or closed from below, according to the state of the room, and the comfort and convenience of the inmates. If from the contiguity of higher buildings, gusts of wind were found occasionally to come down the shaft, any unpleasant sensation of cold might be prevented by a shield placed near its mouth, or by suspending from, the orifice towards the floor, a flue made of coarse, open canvas.

If it should be found necessary at times to close the end of this, ventilation would still go on through the interstices without creating any perceptible draft. When there are other rooms over the workshop, a similar apparatus, with the exception of the dome, might pass through the outer wall, under the ceiling, taking care that the openings are always sufficiently large.

In all workrooms, where a considerable number of individuals are congregated together, the whole of the air should be changed every half hour.

Little as the true principles of ventilation are at present understood, two facts are indisputable, that in all buildings, with doors, windows, and fire-places of the ordinary construction, if the foul air be, by any means expelled, pure air will find an inlet to supply its place; and, that, if a current of pure air can be brought into a room it will dilute and drive out that which is vitiated.

In cutlery, and all other manufactories where steam power is used, the workshops might be effectually ventilated by the revolving fan. This apparatus would remove not only the whole of the vitiated air, but the dust arising from the operation of buffing and polishing silver plate, German silver, Britannia metal, and cutlery goods, and from the sawing and cutting of bones, &c. Above all, no grinder producing dust, should, as he values his life, be without this valuable contrivance for his benefit.

There is one gentleman to whom the working men of Sheffield are much indebted for his philanthropic labours. We are glad to state, on the authority of intelligent grinders with whom we have conversed, that the fans used now, are more than double the number in existence when Dr. Holland published his Vital Statistics of Sheffield, in 1843.

The most systematic use of this apparatus in the town is at the Spindle Works of Messrs. Taylor, Yeomans, and Shaw.

Dry grinding has been carried on with it there for 20 years, without ever producing the least injurious effect.

The best fans, however, we have seen are several which have been recently constructed, and put down at Suffolk Works, by an ingenious razor grinder of the name of Waddington. The draft through these is so great that an iron plate laid on the top of the flue requires a force of four or five pounds to displace it; this force so greatly exceeds that of the inspiration in breathing that no stone or metallic particles thrown off or floating in the air can possibly be inhaled. *The cost of the instrument complete is* FORTY-TWO SHILLINGS, and yet a great number of the dry grinders are without it, although the most ignorant of them acknowledge that if it were used as extensively as it ought to be, the fatal disease called Grinder's Asthma would be unknown to the next generation. We recommend the advantage which would result from the general use of this important machine to the consideration of the Council, and, through them, to the Master Manufacturers, and to Friendly Societies, Funeral Clubs, Secret Orders, and Trades' Unions; and, as scarcely any dry grinder now reaches 50 years of age, we ask whether he ought not to be compelled to use the fan ventilator, and enjoy the average duration of life?

Among the master manufacturers, we have met with many instances of anxiety for the health and comfort of their workmen. We mention with pleasure the works of Messrs. Johnson, Cammell, and Co., and those of Messrs. William and Samuel Butcher, in both of which proper structural arrangements and ventilation have been attended to. The latter are unquestionably the cleanest works in the town. The works of Messrs. Rodgers and Sons are remarkably clean and well regulated, but many of the men in the new workshops complain of the bad state of the ventilation, and of ill-health in consequence. These we found to be intelligent and respectable workmen, but, generally, the artizans of Sheffield have a much stronger conviction of the necessity of better drainage, cleansing, water supply, &c., then for more commodious workshops and better ventilation. They are too apt to think that the momentary sensation of present warmth is better than breathing a pure atmosphere at a somewhat lower temperature. We wish that both masters and men were more impressed with the important fact that vitiated air, such as generally pervades our workshops, produces, as its mildest results, a low state of health, in which the great blessing of life is but half enjoyed;—that pure air invigorates the frame, and makes man less sensible of the changes to which we are subject in this variable climate; and, that we can be useful no longer than we are well.

In connection with the subject of structural arrangements, we beg to urge upon the Council the expediency of public urinals and public conveniences. Every right thinking man will understand the feeling of shame with which modesty seeks, but frequently in vain, in this large town, to hide itself while obeying the imperative calls of nature; and he will also understand the feeling of indignation which must be experienced at the frequent sight of shameless and intoxicated men exposing themselves, even in our greatest thoroughfares.

On the grounds of public necessity then, and of public decency, proper places should be constructed. Human excretions will communicate to the refuse of the town the greatest portion of its value, and therefore they ought not to be wasted.

In every wide open space in the streets urinals might be constructed so as to be externally ornamental. In corners, where buildings, not houses, recede from the streets sufficient privacy might be obtained at a small expense. In many parts of the town, where land is unbuilt upon, small plots in the form of a parellelogram might be set back from the public thoroughfare, screened in front, and fenced sufficiently high on the other three sides, so that they would preclude the appearance of anything disagreeable to the most delicate mind. In the erection of buildings intended for public houses, a recess, or niche, of sufficient size for such purpose, should always be constructed in some part of the external walls.

All such places should be under the surveillance of the Nuisance Officer. A constant stream of water should trickle down the side walls; they should be regularly washed and cleansed by the jet pipe, and should communicate directly with the public sewers.

Most persons admit the necessity of public conveniences; all object to have them near their own premises. We know many persons whose walls are now extensively used in this manner, but they regard as an insult any proposal to construct a public urinal there. The practice complained of continues, nevertheless, and will continue, in all parts of the town; and the question to decide, is simply, whether it shall be done decently or indecently.

THE OBSTRUCTION OF THE RIVERS BY WEIRS AND GOITS, AND ON SIMILAR NUISANCES.

We are fully aware of the jealousy with which any attack on vested rights is always viewed; but we cannot make a faithful Report, which shall be the result of "a thorough and complete investigation into the Sanatory Condition of the Borough," without saying that the health of the town is prejudicially affected by the present condition of the rivers and goits.

There are three weirs upon the river Don, within the precincts of the town, and a like number on the other two rivers, the Sheaf and the Porter. During a considerable portion of the year these obstruct the whole of the streams, and divert them through goits and dams running parallel with the rivers, thus catch-pits are formed for every kind of refuse. The beds of the rivers, for some distance below each weir, are, during the same time, dry, with the exception of the sewer water, and garbage of every possible description, thrown in from the houses and premises adjacent. All this refuse frequently remains stagnant, and putrifying for months during the hottest period of the year, until a flood brings down more water than the mills can take, and it is then washed away.

A description of the effects produced by this abstraction of the streams from their natural courses forms the blackest spot in the Report already alluded to, by James Smith, Esq. He says:—"The natural flow of the water, both of the Don and the Sheaf, are much obstructed by mill-dams, the power acquired by which can be of no great value in a locality where coals are plentiful and cheap, whilst the obstructions they cause are of serious injury to the proprietors and inhabitants of the lower parts of the town. In the dead water caused by one of these dams, near the principal bridge, I saw the decaying carcases of several animals in association with a mass of filth from the sewers, which there discharge their contents into the river." "There exists in the lower part of the town one very obvious and most unhealthful nuisance, which appears to have remained hitherto unnoticed by the authorities. It arises from the existence of an old mill-race, which has been long abandoned, its outlet is closed, and it now remains a receptacle for sewage-water and filth. A number of little courts of inferior houses are situated along the margin, and in some places a row of poor houses on the very brink. The locality is altogether unhealthy and the seat of fever, whenever there are any cases of fever in the town."

We can bear our testimony to the truth of this statement. The reality is beyond the description. After careful examination and inquiry along the rivers, drains, and goits; in every court, and in almost every house, we are convinced that hundreds of human lives have been destroyed by the pestilential condition of these places. We frequently met with instances where three, four, and even five persons had died in the same house within a comparatively short period from fever, or disease of the respiratory organs. Health is the exception, and sickness the rule.

No pecuniary consideration can be of equal value with human life; and therefore we recommend that the water-rights of the millowners within the town be purchased; the weirs removed, and the goits and dams filled up, and turned to the most profitable account consistent with the health of the neighbourhoods in which they are situated. The river beds should then be altered by removing the gravel from the middle to the sides, so as to produce a concave form, and give the greatest possible scouring action to the natural stream of water, when restored to its proper course. These alterations, combined with the removal of all the discharge of the sewers, and the constant daily flow in the principal river, the Don, from the Compensation Reservoirs on the Ewden and Little Don, would prevent stagnation, pollution, and injurious emanations, and convert the river courses within the town into open spaces for light and ventilation. Thus instead of being, as they now are, the sources of pestilence and death, they would become conducive to the general health of the town.

Another subject connected with manufacturing operations, more confined in its extent, but producing evils of the same nature as those we have been considering, is the making of drains to convey sewer-water into wells for the supply of steam-engines. This is a practice of more common occurrence than would be at first imagined. The object is to save the amount which would have to be paid to the Company for a supply of water; the parties do not consider the value of the power expended in pumping, and the damage that may be done to the boilers and machinery by using a fluid containing a large quantity of matter, only in mechanical suspension. Error is generally short-sighted, and men are frequently found injuring others, even at considerable personal sacrifice to themselves.

Two or three instances have occurred within the last two years in which so great an amount of injury was done to the respective neighbourhoods, as to call loudly for more efficient legal powers for the suppression of nuisances of this description.

In the present defective state of the law, the only way in which the parties could be reached was for breaking up the surface of the street contrary to the provisions of the General Highway Act. In our opinion a heavy fine ought to be inflicted for every day during which such nuisance is continued. The constant supply of water which we have provided, would tend much to diminish this, and all similar nuisances, by lowering the rate of charges, and thus removing the principal inducement to commit the offence.

SHEFFIELD UNION WORKHOUSE.

The water supply and drainage of this establishment is in a most lamentable state. We scarcely need say that the older buildings were formerly a cotton mill. From the dam at the Kelham Wheel an arched goit passes through the Workhouse land, and under the centre of the building, in a curved line, emptying again into Messrs. Vickers' goit near the Union Wheel Bridge. In a communication made to us immediately after our inspection, the Governor says—"There are seven water closet drains empty themselves into the mill goit, under the house, and the wash-house, and other sluices from every part of the premises are also taken to it. The number in the house is:—Men, 162; women, 172; children, 179; officers, 18; vagrants, average per night, 20. Total inhabitants of the establishment, 551." There is an accumulation of refuse in the goit immediately below the place where the water closets enter, and from the dam thus formed the water is pumped to supply the whole of the Workhouse for washing, cleaning, culinary, and all other purposes. When we were there a number of paupers were drawing it out of an opening usually covered with a large untrapped grate through which the gaseous results of putrefaction can pass.

This goit-water is used for washing the court yards, thus exposing large surface to evaporation. Previous to being used for cooking or drinking it is filtered, but the process of sand filtration will only remove the mechanical impurities, leaving it still unfit for food.

There is no efficient remedy for this enormous evil, short of an entire alteration of the goit which passes through the premises: it ought to be contracted in size, so as to make a sewer not larger than 2 feet 6 inches high, and 1 foot 9 inches wide, of the form used for the public sewers of the town; with a stream of water from the Kelham Wheel dam running constantly through, so as to keep it continually flushed. This, with trapped communications in every opening, and a constant supply of water from some other source, would very much improve the condition of a Workhouse placed in a situation as unhealthy, probably, as any in the kingdom.

Too great praise cannot be given to the Governor, Mr. Rogers, for the exceedingly clean condition of every place and thing, about the establishment; it is to this, and the excellent medical, and other arrangements made for its management by the Guardians, that the Sheffield Workhouse, with its present defective drainage and water supply, is inhabitable.

We give a plan of the Workhouse buildings, shewing the covered goit in question, with the whole of the drains and grates falling into Messrs. Vickers open goit, immediately after leaving the Workhouse premises.

TOWN INTERMENTS.

Animal instinct teaches us to put entirely away that which is offensive;—all our moral feelings and social affections are shocked at the thought of disturbing the remains of those who were dear to us when living;—our religious sentiments regard the resting place of the dead as a sanctuary not to be lightly profaned;—experience teaches us that death is the commencement of that process by which the body is resolved into its elements, and that the result is the liberation of matters highly injurious to the living;—and yet, notwithstanding all this, we continue to inter the dead in crowded graveyards situated in the midst of our living population.

In one church yard, particularly, the bodies are so closely packed together, that as many as three or four have to be removed in order to give place for a fresh interment. The whole soil, for a considerable depth, is a mass of human decomposition, giving off noxious exhalations in abundance.

Another is partially drained into the street sewer, and along the line of that sewer, within 250 yards of the church, three publicans died last summer, within a very short period. There is reason to fear that the drainage from the churchyard either caused or accelerated the disease which carried them off. Death has the power of propagating itself, as well as life. The immediate effect is, that the air is polluted, and from the position of the *strata* many wells are contaminated. Hence serious injury to health is produced, not only in the immediate vicinity of grave-yards, but at a considerable distance therefrom. If people were aware of the painful and disgusting sights which frequently present themselves in preparing a grave, and of the amount of poison which they are constantly breathing, and sometimes drinking, from the dead, it would produce a deep feeling of horror, and a unanimous effort to put an end to the practice.

The following table shews the aggregate number of interments in some of the burial grounds situate in the densely populated part of the town, from the year 1839 to the year 1846 inclusive :—

Parish Church... ...	5484	Queen-street Chapel ...	24
St. George's	3719	Nether Chapel	72
St. Mary's	1692	Coalpit-lane Chapel ...	9
St. Paul's	1622	Friends' Meeting House	20
St. Philip's	1278	Upper Chapel	60
St. James's	301	Townhead-street Chapel	3
Carver-street Chapel ...	342	Howard-street Chapel...	no return
Roman Catholic Chapel	205	Mount Zion Chapel ...	no return
Total	14,831.		

There are several other burial grounds not included, in which the interments have been very few, but we may safely state that 15,000 dead bodies have been interred in the midst of the living population of Sheffield, within the last eight years.

There can be little doubt that the great number of bodies which are brought, all more or less in a state of decay, into some of our churches on the Sunday, only a short time before the hour of evening service, must poison the atmosphere within the building, and be prejudicial to the health of the congregation.

We are of opinion that intra-mural interments ought to be prevented by Act of Parliament, and that suburban cemeteries should be provided, where none already exist.

The Sheffield Cemetery Company obtained an Act of Parliament last year, enabling them to extend their burying ground to four or five times its present size. The greater part of the New Cemetery will be consecrated for burials according to the rites of the Established Church. A new wide road is about to be immediately made in connection with it, leading from the corner opposite Brunswick Chapel to Sharrow Head. The arrangements for the land, &c., are now completed, and the works will very shortly be in progress; so that, on the passing of any legal enactment relative to interments in towns, Sheffield will be prepared for the change.

The Parish Church Yard is a noble area, and should be kept open as one of the lungs of the town, for ever. It would be well to enclose a narrow space around the church with palisadoes; to remove the present fence, to make it accessible by steps from Campo-lane, and to fix metal posts about four feet apart, along the other three sides; the vacant places might then be flagged, and the whole area left open to the public. A memorial might be raised with a suitable inscription, stating that nearly all the inhabitants of Sheffield, previously to the year 18—, lay buried in the open space surrounding the church.

When the smoke nuisance is removed, this, and all the other extinct grave yards in the town, might be planted with trees and shrubs, so as to provide an additional quantity of oxygen for the inhabitants, in accordance with that beautiful arrangement by which animal substances become the food of plants, and the excreta of plants contribute to the healthy condition of man.

Some provision would probably have to be made for the owners of graves in the present burial grounds. Those who wish, might have the stones remain to mark the resting place of their dead. Persons who have purchased graves within a certain number of years, and all who are now possessed of rights of interment, but would be unable to bear the expense consequent upon the change, should have the privilege, within a specified time, of having their stones removed and graves assigned to them at the public expense.

If any injury should be sustained by loss of burial fees, a proper compensation should be paid. Private interest on the one hand, ought never to prevent the public good, and on the other, the improved condition of the people, and the enormous money gained to the borough, from efficient sanatory arrangements, will render any such sacrifice unnecessary.

EXTENT OF THE NECESSARY SANATORY POWERS, AND IN WHOM TO BE VESTED.

We trust we have made it clear to the Council, that the various departments of the public service, which have a tendency to improve the health of the town, are all intimately connected:—that the streets, lanes, courts, and houses, can never be *effectually* cleansed until they are paved, and only then, by the agency of a greatly increased supply of water:—and that the complete underground drainage of the town demands, as an essential part of the system, an abundant supply of the same element, constantly flowing. Water must not be looked upon in future as an article to be stored, and used with great care for washing, and dietary purposes only, with penalties imposed for any wasted, but must be used by every body, *lavishly;*—as the great agent, in connection with town cleansing, and drainage, for removing immediately, every kind of refuse, that is, or would become, offensive and injurious to health. The water supply, cleansing, and paving are at present in the hands of three distinct bodies, under the authority of as many distinct Acts of Parliament. The sewerage, though much has been done during the last few years, is illegitimate. All these must be harmoniously worked together as parts of the same system; and we are firmly convinced that this can only be done by placing them, and all other sanatory arrangements, under the controul of one public body.

We believe that in Leeds, and several other large towns, the sectional boards, tenacious of life, oppose this transfer of their present limited powers; but common-sense dictates that in Sheffield, and all other incorporated towns, the Municipal Council is the only body to whom these important powers should be intrusted.

We have found, in our inspection of the town, that many lives are sacrificed in consequencs of evils existing upon property, over which, those who suffer have no controul. To mention only one instance,—the late prevalent fever was perhaps worse, and more fatal, in the lower part of Hanover-street and Ecclesall-road than in any part of Sheffield; this would, at first sight, appear inexplicable, as the neighbourhood is on the outskirts of the town, and open to the pure air from the western part of the borough. We found that there had been a great number of deaths from typhoid fever, within a stone-throw from each other, since about December last, and have no doubt, after a careful investigation, that this fever was produced by the malaria arising from a stagnant pond behind that part of Hanover-street. An excavation appears to have been made for brickmaking, and into this flowed the whole drainage from a great number of houses. When we were there, a man was forming a small sough to drain it off; and we found the mud to be of that black and fœtid kind which we had observed in other neighbourhoods where the fever had raged. Who can compute the amount of misery which might have been prevented in that neighbourhood, within so short a period, if there had been in existence any authority to compel the owner of the land to spend a few pounds? What an aggregate amount of unnecessary physical suffering must have been endured by those destroyed! What mental anguish by the bereaved! and what evil may result to the children thus left without the guidance of a parent; and through them, to society at large!

It may be said, that this is an extreme case;—the report of our inspection will show that there are many others nearly as bad; and the condition of all the unhealthy parts of the town would convince any reasonable man that those who suffer from external causes are generally innocent. Disease and death surround their dwellings, and stand waiting at their doors. It is the multitude of little evils that constitute, by their united effects, the great one, and cause Sheffield, notwithstanding its advantages of situation, to be one of the most unhealthy towns in the kingdom. By the constitution of this country, no man is allowed to injure, or take the life of another, or even of himself; and we are, therefore, of opinion, *that sanatory measures, to be efficient, must be compulsory on all parties, without exception.*

The Town Council being the controuling body, it follows that the district must include the whole of the borough.

The paving, cleansing, surveillance of nuisances, and jurisdiction of the Health Officer, could extend over the whole district, and the rates be either collected in the nature of a borough rate, or the necessary amount for the expenditure of each township might be estimated, levied, and expended separately; so that distinct accounts should be kept under the same general management. The water should be laid on to all parts of the borough that can be supplied. We think the watch boundary would be found generally the best that could be adopted for the sewerage. The first cost for private pavements, for the drain from each building and court to the sewer, and for the internal fittings for water supply, should be, as we have already stated, repaid by the owners of property, as being permanent improvements to his estate. The public sewerage, street water-mains, payments for water, interest of capital expended on works, &c., and the subsequent maintenance of the whole system, should be provided for by public rates. We are bound to state that in this respect the same amount would have to be expended annually for empty houses as for those occupied. This presents a difficulty which must be surmounted. Ought the owners of cottage property to be compelled to pay the rates? We think that sanatory regulations will very much increase the value of property;—that conditions may be wisely laid down to prevent pecuniary loss;—and that under such conditions they should be the parties legally liable. We do not presume to lay down precise rules, but we can conceive a graduated scale of composition in direct proportion to the number of houses unoccupied to meet extreme cases; or, the payment of a sum, bearing an inverse ratio to the time each house may have been empty. We have no hesitation in saying that the health;—the physical energy, and consequently the money-producing power of the artizans of Sheffield may be so raised, as to enable them to pay, with ease, much more than can ever be demanded by the landlords, as additional rent for all necessary sanatory regulations.

We think that the Council should have the power to appoint an Inspector of Nuisances, and a Health Officer, of high medical and general attainments, both of whom should be empowered, in the execution of their duty, at all reasonable times, to visit houses, workshops, and all other private premises; and also that all lodging houses should be licensed, and placed under their jurisdiction.

We are of opinion that no slaughter-houses, or premises for the carrying on any offensive, or injurious trade operation, should be allowed in future to be erected within the town; and that power should be given to the Council to purchase the buildings where such injurious trades are now conducted, or, as the case may be, to pay the owners or occupiers of such premises; and also, of goits, dams, and weirs, compensation for removal and loss of business.

We also think that the Council should have power to make open places in the town for light and air, public walks, parks, or promenades, in the environs, for the free use of the whole of the inhabitants.

We have already endeavoured to shew the importance of this in an earlier part of our Report.

Many trades of the town are very laborious,—they cause profuse perspiration; and are of such a nature as to soil the skin, and render frequent bathing and washing very desirable. Unfortunately the working men of Sheffield can seldom enjoy the luxury of a bath. We strongly recommend the construction of public baths for the use of the working classes; accessible to all, at the smallest possible charge for admission.

We have already said that public washhouses are generally important, but we think they are not nearly so much so in Sheffield as in many other large towns.

We have described the construction of cottage houses here, as compared with those in other places; and have stated that nearly every family in the town occupies a separate dwelling, with oven, set-pot, and sinkstone. We may add that some thousands of the working classes have sculleries, or small kitchens attached to their houses. If the cottages in Sheffield were well drained, and had a constant supply of water, very few indeed of the occupants would avail themselves of public washhouses. In London, Liverpool, and Manchester, where such institutions have been established, four or five families frequently occupy one house, and are entirely destitute of the conveniences enjoyed by the industrious classes of Sheffield.

BEST MODE OF REPAYMENT BY OWNERS FOR PERMANENT IMPROVEMENTS.

We have recommended that the paving and draining of court-yards, the draining of houses and buildings, and the fittings for the water supply, should be executed, in the first instance, by the public authorities, and that the cost of these permanent improvements should be repaid to the Corporation by the owners.

We now come to consider the best mode of repayment. It would be impracticable to call upon the owners of property without exception to pay for such improvements immediately on their completion. There are many persons of small fixed incomes derived from property, who would be absolutely deprived of the necessaries of life. Many widows of men who were cut off when they had but just commenced to accumulate a maintenance for a large family. Persons with only a life interest in the property which they hold; and mortgagees scarcely able already to realize interest upon the sums which they have lent. Very great injury would, therefore, be inflicted by such a proceeding. These improvements would permanently enhance the value of the property; and therefore the future owners would derive as much, if not greater, benefit than the present; they, therefore, ought to bear a fair part of the burden.

No injustice or hardship would be felt either by the present, or future owners, if the repayment were spread over a long term of years, as recommended in the Sanatory Report of the Poor Law Commissioners. We are, therefore, of opinion, that the repayment for permanent sanatory improvements to property should be spread over a period of not less thanthirty years: the owner, of course, having the option of paying the whole, either at the first, or at any time during that period. The tenant should be liable to pay the annual instalment for principle and interest, and be empowered to deduct it from his rent. The amount would be collected with the other rates, and with similar powers for recovery from defaulters.

We have already shewn that the New Works would supply water at about *one penny* per thousand gallons, the charge would, therefore, not exceed one penny per week for the industrious classes. The public drainage is estimated at £82,484. The interest upon this sum at 4 per cent. is £4,300 per annum; equal to 4s. 3½d. each, on the average, for 20,000 houses. The house drainage, at the high rate of £2 15s. for each house, would require the annual instalment of 3s. 3½d. to repay the principal and interest in thirty years. The cost of maintaining the public highways, on the best and most economical system, would not, (when the drainage is otherwise provided for) exceed 6d. in the pound, or, for a cottage of £5 rateable value, the sum of 2s. 6d. per annum; and we have already shown, above, under its proper head, that the cleansing would probably cost *one shilling* per year, average, for each house:—we are able, therefore, to sum up the amount which a respectable artizan may be probably called upon to pay for these important sanatory improvements:—

	YEARLY CHARGE.	
	s.	d.
A constant supply of water	4	4
Complete and efficient public drainage	4	4
House drainage (payment for 30 years)	3	3½
Pavement of the public highways	2	6
Cleansing	1	0½
	15	6

Equal to 3⅗d. per week.

To balance this weekly charge of about 3½d., we must remember that the following, now paid for the same class of houses, under the present inefficient arrangements, would cease, or be included in the above:—

	s.	d.
Water rate	6	4
Highways	3	4
Cleansing ... ... about	0	8
Yearly charge	10	4

Leaving a difference of 5s. 2d., or less than *one penny and a farthing* per week addition to the amount at present levied.

In the above attempt to bring home at once to the minds of the industrious classes, the amount they may be called upon to pay for improved health, cleanliness, and comfort, we have not included the expenses of general management under an efficient sanatory system, but it will be at once acknowledged that these will be more than covered by the funds arising from the disposition of the refuse of the town for agricultural purposes. We are bound to add that if the works of the present Water Company be purchased, the charge for water would be higher than we have stated above.

For constructing and carrying on these important works, the Council would require a large capital. We have already hinted that in some instances,—as that of the Water Company,—security for an annual payment might be a satisfactory mode of compensation; for other purposes, the public funds of the borough, derived from rates, would be such an excellent security, that we have no doubt the money would be easily obtained, and at considerably less interest, either from individual capitalists, or the National Exchequer, than would be required of any private trading company.

Thus we have treated of the various subjects set forth at the commencement of this part of the report. We wish we could find language sufficiently strong to impress upon the Council the absolute necessity for immediate action. The case is desperate, and supineness would be criminal. After the first few day's experience in our recent inspection, we were able, with an awful precision, not only to detect the unhealthy parts of the town, but the portions of streets, and the particular houses in streets and in courts, especially liable to febrile and other diseases. In hundreds of these we were able at once to describe to the sufferers all the symptoms of the disorders with which they were afflicted. The result of that inspection is a conviction, which nothing can ever remove, or weaken;—that besides all the instances in which persons ultimately recover from long sickness, and consequent distress, *one thousand*, at least, are destroyed every year in this town by diseases, which would have no existence under complete sanatory arrangements. To realize in the aggregate this *unnecessary* amount of mortality, and to appreciate the concomitant evils of domestic bereavement, pecuniary embarrasment, struggling poverty, and helpless pauperism following in its train, must appal the mind of every member of the Council, and lead to the most strenuous efforts in the application of remedial measures.

Whether what we have recommended be, under the circumstances, the best, the Council will now judge. Our official position in the town has necessarily led us to think long on these subjects, and we candidly admit that our views on some points of sanatory reform have become much altered during the last five years, but that cumulative experience has always impelled us in the direction of more complete and efficient measures, has strengthened the conviction, already existing, that each branch must be considered an integral part of the same grand system, and that, to be effectual, the whole must be harmoniously worked together under one controlling power.

The present railway movement will doubtless convey to future ages strong proofs of expanded intellect, applied to the production and distribution of wealth in connection with increased facilities for intercommunication between distant places; but the fact that sordid money-getting speculation is one of the principal causes of the movement, will also become matter of history. The efforts *made to effect* a national system of sanatory reform proceed from a much higher motive:—that of disinterested philanthropy, and its permanent results on the economy of human life will make it the glory of the age in which we live. It is not easy to comprehend the difficulties which have to be surmounted by those who take the lead in a movement like this, or the amount of patient, unwearied labour and investigation requisite to convince a nation, even of that which is essential to its best interests.

Posterity is able to look back, without the distraction arising from a multitude of other considerations, and appreciate the exertions of the individual who has devoted himself to an improvement in the condition of his fellow-creatures. We venture to predict that the name of Chadwick, as the first pioneer in Sanatory Reform, will be held in lasting remembrance as that of a great benefactor to his country. Happy shall we be if any effort of ours contribute, even in the smallest degree, to forward in this place the great work commenced by him.

CONCLUSION.

In conclusion we regret that we have been unable to obtain any information from the Boards of Guardians, or Superintendent Registrars, relative to the rate of mortality and the classification of disease. We append the correspondence which has passed on these subjects.*

We had conceived that the system of registration was established in order to furnish genuine and authentic data from which the vital statistics of the country, or of any portion thereof, might be deduced.

We knew that the Poor Law Commissioners were the first to institute such inquiries through their Secretary, Assistant Commissioners, and the officers of the Unions throughout the country, and that such investigations would prove the existence of an enormous amount of preventible pauperism and misery, and also that the ratepayers are now compelled to pay much higher poor-rates than would be required under better regulations.

The rule of the Registrar General respecting the communication of information on such subjects appeared to us intended to prevent any Superintendent Registrar from "printing and publishing," on his own private and personal account, the statistics which come into his hands officially. We knew that the predecessors of the present Superintendent Registrars afforded all the assistance in their power to Dr. Holland when he was compiling his "Vital Statistics of Sheffield;"—and we did not therefore contemplate, in our arrangements with the Health Committee of the Town Council, that we should have to pay the officers of a department of the public service so closely affected by the investigation, as the administration of the Poor Laws, for any information that might be necessary to make our Report as complete as possible.

We append also the communications which we have received from medical gentlemen in the town.†

Some of these contain important suggestions; they corroborate our statements as to the ravages committed by preventible disease; and distinguish many of the localities which we had already found to be specially unhealthy.

Much interest was excited by our inquiries, especially amongst the industrious classes. A report prevailed that some inspection of the houses was about to take place, and we found that a considerable amount of colouring and whitewashing had been done under the impression that "the Commissioners were coming."

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* The Committee do not think it necessary to print the correspondence here referred to.

† These letters have also been withheld from a desire not to increase the bulk of the Report.

JOHN BRIDGEFORD, PRINTER, IRIS-OFFICE, SHEFFIELD.

PREVENTIBLE EXCESS OF SICKNESS AND MORTALITY, AND CONSEQUENT PECUNIARY EXPENSE,

CREATED BY THE WANT OF DRAINAGE AND OTHER SANATORY MEASURES IN THE COUNTY OF YORK (WEST RIDING).

Explanatory Observations.—The following view of the rates of Births and Deaths amongst the Populations of differently conditioned Districts in the County of York (West Riding), is made up from the Returns to the Registrar-General during the year 1841, estimated in the several modes used by Mr Chadwick in the Sanatory Report. One of the chief of these is, the comparative rates of infantile mortality in different districts, as shown in the proportion of deaths of children under one year, to the births of children (column 7), children being the most susceptible to atmospheric influences, and the rate of mortality amongst this class being the least affected by migration and immigration, and not at all affected, as the adult classes are, by the physical circumstances attendant on their occupations. 2ndly, Proportions of deaths from epidemic diseases (column 8). In well-drained, well-cleansed, and well-ventilated public establishments, typhus and other diseases are rarely found to arise, and when they do arise, are seldomer fatal. The great mass of this class of deaths are proved to be preventible. The health of populations in well-drained, well-cleansed town districts, have, in particular instances, been increased beyond the average of rural districts; and it is possible that all may be greatly advanced. The lowest rate of mortality found in the districts of which an account is given beneath, is yet much higher than classes in good physical circumstances are known to attain, namely, of the Society of Friends—upwards of fifty-two years for all born. The pecuniary consequences of the preventible excess of deaths, are set down as an average expense of at least £5 for each funeral; but beyond this it is found that for every death in excess, there has been at th least twenty-eight cases of sickness in excess, the expense of which cannot be less than £1 per case; beyond this, the premature death of an adult labourer involves a loss of productive labour averaging not less than 10s. per week for each male, and 5s. for each female, or 7s. 6d. per week male and female; which for all classes, skilled and unskilled labourers, will be a low average loss, beyond the prime cost of their maintenance. It has been demonstrated as a general law in the Sanatory Report, that amidst large masses of people, the ravages created by an excessive mortality, are more than made up by an excess of births, and that pestilence, instead of diminishing, rather increases the numbers of the population. It has also been proved, and is now matter of extending experience, that in the rural districts, the defective drainage and stagnant moisture, which give rise to epidemics amongst men, give rise also to epidemics among stock, and diminish, at the same time, the amount of vegetable production to maintain them. The more the facts are examined, the more it will be found, that there is no larger economy than in well-directed sanatory means of prevention, and that the pecuniary losses hereunder set forth as resulting from preventible causes of disease, are greatly under-estimated.

Excess beyond the Loss of Life experienced at PATELEY BRIDGE, &c., *preventible in each District.*

POPULATION.	REGISTRATION DISTRICTS.	Total Number of Deaths in each District during the year 1841.	Total Number of Births in each District during the year 1841.	Proportion of Deaths, in 1841, to the Population in each District.	Proportion of Births, in 1841, to the Population in each District.	Proportion of deaths of Infants, under 1 year, to the Births in 1841.	Proportion of Deaths from Epidemics in each District, in 1841, to Population.	Average Age of all who have died in each District.	Average Age of all who have died above 20 years.	Proportion per Cent. of Deaths, at each interval of Death to Total Deaths, in each District.												Excess in Number of			Years' Loss of Life to		Total Loss of Money Value of Productive Labour, at 10s. per week Men, and 5s. per week Women, say 7s. 6d. per week to each Adult Individual.	Total Loss on the Year's Death in				Approximate Proportion of Life lost by each Person.
										Under 1 year.	Under 5 years.	Under 15 years.	Under 20 years.	Between 22 & 30.	Between 30 & 40.	Between 40 & 50.	Between 50 & 60.	Between 60 & 70.	Between 70 & 80.	Between 80 & 90.	90 and upwards.	All Deaths.	Deaths of Adult.	Births	Every Individual.	Every Adult.		Sickness.	Funerals.	Labour.	Total.	
				One in	One in	One i	One in	Yrs. Mos.	Yrs. Mos.																Yrs. Mos.	Yrs. Mos.	£	£	£	£	£	
54,183	Pateley Bridge, Ripon, and Knaresborough... ...	961	1505	56	36	8	437	36 3	60 0	20·1	31·	38·8	42·6	7·6	5·1	5·8	6·5	9·1	12·8	9·1	1·2	—	—	—	—	—	—	—	—	—	—	—
47,716	Doncaster and Thorne	1040	1549	46	31	7	212	32 5	58 2	20·	34·5	44·1	47·6	6·8	6·5	5·7	5·4	8·6	11·6	6·6	1·2	194	59	279	3 10	1 10	36	5,432	970	19,620	26,022	1-10th
47,668	Skipton, Sedbergh, and Settle	953	1462	50	33	8	316	31 11	55 8	19·9	33·8	41·2	46·3	9·1	6·7	5·8	6·	8·5	10·2	6·3	1·1	107	25	138	4 4	4 4	64	2,996	535	32,704	36,235	⅛
45,648	Wakefield	971	1674	47	27	8	284	30 5	53 11	21·9	35·2	42·6	46·9	9·1	6·8	8·1	5·7	9·3	9·3	4·2	·6	160	50	406	5 8	7 1	138	4,480	800	71,070	76,350	1-6th
61,989	Selby, Goole, and Pontefract	1285	2173	48	29	6	241	29 1	59 4	26·4	42·3	50·9	54·1	6·4	4·2	4·3	5·2	7·4	10·5	6·8	·9	181	—	451	7 2	0 8	13	5,068	905	7,644	13,617	1-5th
63,269	Otley and Keighley	1196	2071	53	31	7	419	28 5	54 11	25·8	40·1	46·9	51·7	8·7	7·1	5·	5·3	7·1	7·6	6·5	·9	73	—	313	7 10	5 1	99	2,044	365	57,123	59,532	1-5th
58,783	Rotherham	573	987	50	29	7	411	28 5	54 6	23·3	33·5	45·8	53·1	8·4	5·6	4·4	7·5	8·4	7·4	4·7	·4	59	—	188	7 10	5 6	107	1,652	295	28,569	30,516	1-5th
107,140	Huddersfield	2122	3994	50	27	7	394	27 3	52 5	26·	40·3	47·2	51·4	9·4	6·9	6·3	6·1	7·1	8·9	3·6	·2	219	—	1018	9 0	7 7	148	6,132	1,095	152,292	159,519	¼
109,175	Halifax	2202	3888	50	28	7	353	26 10	53 9	24·8	41·6	48·5	53·9	7·6	6·5	6·2	6·4	6·7	8·6	3·8	·3	266	—	856	9 5	6 3	122	7,448	1,330	22,552	31,130	¼
113,149	Saddleworth, Ecclesfield, Wortley, and Ecclesall Bierlow	2340	3998	48	28	7	234	26 3	52 10	23·8	43·2	52·	55·6	8·	6·	5·5	7·	7·6	6·6	3·5	·3	331	—	845	10 0	7 2	140	9,268	1,655	145,600	156,523	¼
60,713	Dewsbury	1236	2461	49	25	7	325	23 6	52 0	28·2	46·2	53·6	59·	7·7	6·6	5·6	4·9	6·4	5·7	4·	·2	157	—	775	12 9	8 0	156	4,396	785	79,091	84,273	1-3rd
168,667	Leeds	4361	6696	38	25	6	189	23 4	51 1	25·8	46·9	54·7	58·2	7·3	6·9	6·7	5·4	7·3	5·3	2·5	·3	1169	104	2011	12 11	8 11	174	32,732	5,845	317,028	355,605	1-3rd
85,076	Sheffield	2231	3395	38	25	6	195	22 6	51 6	25·4	49·7	56·7	59·9	6·6	6·1	6·7	6·	6·1	6·3	2·1	·1	722	27	1032	13 9	8 6	166	20,216	3,610	148,404	172,230	2-5ths
132,164	Bradford...	3041	5212	43	25	6	211	20 3	50 7	29·5	50·8	58·9	64·6	7·7	5·2	4·5	5·3	5·1	5·2	2·3	·2	696	—	1541	16 0	9 5	184	19,488	3,480	197,800	220'768	3-7ths
1,125,340	Total	24,512	41,055	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4334	265	9853	—	—	—	121,352	21,670	1,279,298	1,422,320	—
	Average	—	—	50	27	7	25 9	25 11	53 6	25·2	43·2	51·	55·3	7·8	6·3	5·9	5·8	7.1	7·5	3·9	·4	—	—	—	10 4	6 6	127	—	—	—	—	2-7ths

	Districts.		
Total Number of Adults prematurely dying...	Bradford	690, or to every 10,000 of the Population	52
	Pateley Bridge	240 „ „	44
Number of all Classes killed by Epidemic, Endemic, and Contagious Diseases... ...	Bradford	625 „ „	47
	Pateley Bridge	124 „ „	23
Deaths of all classes from Diseases of the Respiratory Organs	Bradford	802 „ „	61
	Pateley Bridge	185 „ „	34

		Bradford District.	*Pateley Bridge, &c., District.*
Proportion of Deaths to the Population of 1841	1339	1 in 41	1 in 50
	1840	1 in 42	1 in 55
	1841	1 in 43	1 in 56
Proportion of Births to the Population of 1841	1840	1 in 26	1 in 36
	1841	1 in 25	1 in 36
Proportion of Marriages to the Population of 1841	1840	1 in 125	1 in 137
	1841	1 in 132	1 in 165

(From the Sheffield Iris, of September 2, 1847.)

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